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AN EXPERIMENTAL STUDY OF HELICOPTER ROTOR IMPULSIVE NOISE

By

W. E. Bausch

C. L. Munch

R. G. Schlegel

June 1971

EUSTIS DIRECTORATE
U. S. ARMY AIR MOBILITY RESEARCH AND DEVELOPMENT LABORATORY
FORT EUSTIS, VIRGINIA

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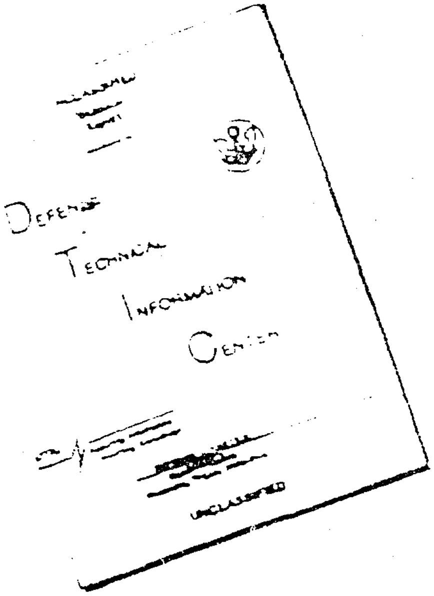
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William E. Bausch
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13. ABSTRACT

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Correlation of calculated and measured noise harmonic amplitudes is generally within 5 dB through the third harmonic at distances less than 1000 feet in front of the helicopter. Waveform correlation of calculated and measured time histories of acoustic pressure is good. RIN is identified as being primarily a rotational noise phenomenon, ordered at the blade passage frequency and its harmonics, rather than amplitude modulated broadband noise. Hover RIN is shown to be due to vortex interference (blade/wake interaction RIN), while cruise RIN is shown to be due to the combination of acoustic effects of a high subsonic tip Mach number on wave propagation and blade drag, and is herein referred to as advancing blade RIN.

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This contract was initiated (1) to acquire simultaneously CH-53A helicopter noise and rotor airloads data for impulsive and nonimpulsive flight conditions and (2) to correlate these data with noise and airload prediction methods. More specifically, knowing the airloads and the associated noise levels, an acoustic analysis developed under a previous contract was modified with the hope of being able to predict the occurrence of impulsive rotor noise. A marked improvement in the ability to make acoustic predictions during the design of a new helicopter was expected.

From this and earlier studies, the consensus is that impulsive rotor noise is not severe amplitude-modulated broadband noise, but ordered rotational noise rich in higher harmonic content. Consequently, the ability to predict the occurrence of impulsive rotor noise requires considerable knowledge of the high-frequency airload content. Existing rotor airloads analyses are adequate for investigations of rotor and fuselage dynamics, but they are sorely lacking in defining the higher harmonics of airloads necessary for detailed acoustic analyses. However, before this study was initiated, it was believed that knowledge of the chordal airload distribution could compensate for the lack of high-frequency airloads data. Results of this study do show that knowing the chordal airload distribution enhances prediction accuracy of the lower harmonics of rotational noise. However, knowing the chordal airload distribution, the analysis remains incapable of predicting the higher rotational noise harmonics characteristic of impulsive rotor noise. Consequently, it would appear reasonable to conclude that, with or without the airloads known, this analysis cannot predict the occurrence of impulsive rotor noise. However, an analysis such as the one reported herein does have the potential for predicting the occurrence of impulsive rotor noise; but to succeed, major advances in modeling the rotor wake and accounting for rotor blade/vortex wake interactions and compressibility effects are needed. Solutions to these needs cannot be anticipated in the near future.

This program was conducted under the technical direction of Mr. Joseph H. McGarvey of the Reliability and Maintainability Division of this Directorate.

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Final Report

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W. E. Bausch
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Prepared by

Sikorsky Aircraft
Division of United Aircraft Corporation
Stratford, Connecticut

for

EUSTIS DIRECTORATE
US ARMY AIR MOBILITY RESEARCH AND DEVELOPMENT LABORATORY
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Results of a study of helicopter rotor impulsive noise (RIN) are presented in this report. Rotor noise, together with rotor blade dynamic and pressure data, was measured during hover and cruise of a CH-53A helicopter for use in a correlation study of calculated and measured noise. In addition, the rotor rotational noise analysis described in U. S. Army Aviation Materiel Laboratories (USAAVLABS) Technical Report 70-1B was modified to reduce computation time and to include blade flapping and coning motions. The inclusion of these motions, however, is shown to have little effect on the predicted noise.

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FOREWORD

The work reported herein was performed by Sikorsky Aircraft, Division of United Aircraft Corporation, under contract DAAJ02-69-C-0035, Task 1F162204A14235, for the Eustis Directorate, US Army Air Mobility Research and Development Laboratory, Fort Eustis, Virginia. Portions of the data collection and analysis tasks were performed by H. R. Mull and Associates, Wilton, Connecticut. The work was carried out under the technical cognizance of Mr. Joseph McGarvey of the Eustis Directorate, USAAMRDL staff. Sikorsky Aircraft personnel directly associated with the project included Mr. W. E. Bausch, Mr. C. L. Munch, Mr R. G. Schlegel and Mr. J. J. DeFelice. H. R. Mull and Associates personnel directly involved included Mr. H. R. Mull, Mr. J. Dunmore, and Mr. A. Smardin.

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LIST OF SYMBOLS

(Applies to Body of Report Only)

A	Amplitude of pressure pulse
B	Number of rotor blades
C	Radial force component
C_m	Sound pressure amplitude of m^{th} sound harmonic
D	In-plane (drag) force component
dB	decibel, referenced to 0.0002 microbar
$J_n(Z)$	Bessel function of the first kind, order n, argument Z
L	Any force component (thrust, in-plane, radial)
M	Rotational tip Mach number
M_a	Advancing tip Mach number $(M + M_F)$
M_F	Flight Mach number
M_r	Component of flight Mach number in direction of observer
P	Period of pressure pulse
R	Rotor radius
SPL	Sound pressure level, decibels
T	Rotor thrust force component
V	Forward translational velocity
V_t	Tip speed of blade
a_o	Speed of sound
$a_{oT,oD,oC}$	Steady Fourier components of thrust, in-plane, and radial force components
$a_{\lambda T,\lambda D,\lambda C}$	Fourier cosine components of thrust, in-plane, and radial forces
$b_{\lambda T,\lambda D,\lambda C}$	Fourier sine components of thrust, in-plane, and radial forces
i	Imaginary number $\sqrt{-1}$

k	Airloading harmonics decay power law exponent
m	Sound harmonic number
r	Distance from hub to observer
x, y	Field point coordinates of observer
λ	Airloading harmonic number
Ω	Rotor rotational speed, radians/second
ψ	Azimuth angle in rotor disk measured from tail of aircraft

1.0 INTRODUCTION

Over the past several years, noise generated by all types of aircraft has become a source of increasing concern in military as well as civil applications. The civil operator is concerned with community acceptance (or tolerance) of the vehicle so that it may be used near or in population centers; the military operator is concerned with the aural detectability of the vehicle in an effort to improve its survivability and combat effectiveness.

The helicopter, because of its unique operational capabilities and the requirements placed upon it, is a prime candidate for noise studies. The past few years have seen the initiation and completion of many helicopter noise studies, both theoretical and experimental, to identify and quantify the mechanisms by which the noise is generated, propagated, and received and to find the means to reduce it.

The helicopter generates noise of both mechanical and aerodynamic origin. Mechanical noise, such as that due to the gearboxes, bearings, hydraulic systems, etc., is in most cases important only at locations near the helicopter. Of the aerodynamic sources, such as the main and tail rotors and the engine compressors, main rotor generated impulsive noise (when it occurs) can be by far the most predominant noise, exceeding even piston engine exhaust noise (as has been shown recently by Cox and Lynn, Reference 1). While the other aerodynamic sources of helicopter noise (rotor rotational noise, rotor vortex noise, turbine engine compressor noise, etc.) have been studied in quite some detail during the past few years, rotor impulsive noise has been generally referred to as a unique and separate phenomenon and has been largely ignored until very recently. The study reported herein seeks to experimentally identify the mechanism(s) which produce(s) rotor impulsive noise (RIN), to determine whether this noise is primarily rotational noise or amplitude modulated broadband noise, and to determine whether present theory can accurately predict this type of noise.

The study has been broken down into three phases: (1) flight test, (2) data reduction, and (3) analysis and correlation. During the flight test phase simultaneous measurements of rotor blade airloads and motions, aircraft operating parameters, and external noise on the ground were made on a CH-53A helicopter for hover and several forward cruise speeds. In addition, internally mounted directional microphones were placed against the windows on opposite sides of the cabin to determine the azimuthal locations of the rotor blades at the instant impulsive noise was generated.

The data reduction phase involved reducing the measured aerodynamic and acoustic data into useful forms. Rotor blade differential pressures were reduced to harmonics of 1 per rev for use in the noise prediction program and to time history pressure plots for correlation with the predicted external time histories and internal noise data. A real-time, narrow bandwidth spectrum analyzer reduced the measured external noise into amplitude-vs-frequency plots at specified intervals along the flight path for cruise and averaged spectra at several hover positions. External

noise was also reduced to octave band time histories during flyover and to octave band spectra at twelve azimuth locations in hover.

During the analysis and correlation phase, the measured aerodynamic and acoustic data were used to determine the locations in the rotor disk where impulsive rotor noise is generated during hover and cruise flight.

In addition, modifications were made to the rotational noise prediction program to include the effects of rigid body blade flapping and rotor shaft tilt, and to produce a time history of acoustic pressure at specific field points (Appendix I). This program was then used to predict the radiated noise using measured airloads as well as airloads predicted by the classical helicoidal wake analysis for correlation with noise measured at the ground station.

2.0 ROTOR IMPULSIVE NOISE (RIN) GENERATION

RIN, when it occurs, is the most significant and annoying of all helicopter noise sources. RIN (or "blade slap", "thump", "crack", "pop", etc., depending upon its intensity and pulse shape) can be observed on both single- and multiple-rotor helicopters, depending primarily upon the flight conditions and aircraft configuration. Because of the unique character and low fundamental frequency (fundamental blade passage frequency) of RIN, machines experiencing it can usually be detected at greater distances than similar, nonimpulsive noise-generating helicopters. Furthermore, helicopters exhibiting RIN are more annoying than those without this type of noise (Reference 5).

Several investigators (References 1 through 3) have postulated that the observed character of impulsive noise from rotors is due to severe amplitude modulation of broadband noise. While this phenomenon can be observed during RIN conditions, it is highly unlikely that it is the sole cause of the impulsive type waveforms which are observed by the ear to be impulsive noise.

RIN, occurring at the fundamental rotor blade passage frequency, is primarily a harmonic phenomenon, and its origin appears to be ordered rotational noise rather than random broadband noise. A Fourier analysis of periodic impulsive noise produces a frequency spectrum with very high harmonic content and relatively little amplitude decay with frequency. This has recently been demonstrated analytically by Lowson and Ollerhead (Reference 4) and Leverton (Reference 5), and experimentally by King and Schlegel (Reference 6). King and Schlegel found that during nonimpulsive noise conditions, blade airloading harmonics decay approximately as $1/\lambda^{1.4}$ to $1/\lambda^{1.6}$ while during impulsive noise conditions the airloads decay about as $1/\lambda^{0.6}$ (λ = airload harmonic order). The increased high frequency airloading harmonic levels for the impulsive noise case result in increased high frequency sound harmonic levels, yielding the observed "slap". Furthermore, the phasing of the sound harmonics is important in determining the impulsive nature of the observed sound; for example, a harmonic spectrum with harmonics phase shifted by, say, 90 degrees with respect to the fundamental, may be more impulsive than one with all harmonics in phase. In a recent paper, Sadler and Loewy (Reference 7) indicate that the high frequency content of RIN may be primarily associated with vortex (broadband) noise. This, too, appears to be highly unlikely since vortex noise is random in amplitude, frequency, and phase. Consequently, it does not contain the necessary harmonic content and phase coherence necessary to define an impulsive sound.

Classically, there have been three main mechanisms for the generation of RIN postulated in the literature. These are summarized by Leverton (Reference 5) as the following:

1. Fluctuating forces due to blade/vortex intersection.
2. Fluctuating forces resulting from stalling and unstalling of the blade.
3. Local shock wave formation on portions of the blade.

The literature is in general agreement that the first is the primary source on tandem-rotor machines and in some cases on single-rotor machines. The second mechanism, that due to stall effects, is generally losing support as a probable slap mechanism. Leverton discusses the reasons in some detail in Reference 5. To summarize, it is believed that the stall process is relatively slow and does not produce the sharp changes in loading necessary to produce RIN. This is illustrated in Figure 1 (from Reference 5) where the stall duration is compared with a typical impulse duration on the basis of azimuthal movement. The impulse location in the disk o Figure 1 is purely arbitrary. The third RIN mechanism, that of local shock formation due to high advancing tip Mach numbers, is quite a complex subject. However, as pointed out by Ollerhead and Lowson (Reference 8), these shocks cannot propagate to an observer unless the blade actually exceeds sonic velocity. This does not appear to be a primary mechanism of RIN generation.

The only mechanism remaining to explain the occurrence of RIN is blade/vortex interaction. This mechanism does not, however, explain the occurrence of RIN on single-rotor helicopters during high speed flight where the observed "slap" is very intense as the helicopter approaches, but rapidly decreases as the helicopter passes overhead and retreats. There must then be another mechanism which is responsible for this type of RIN. Ollerhead and Lowson (Reference 8) indicate that this phenomenon can be explained as an acoustic effect due to increased tip speeds, and Arndt and Borgman (Reference 12) show that compressibility effects may also contribute. Thus, it appears there are two types of impulsive noise, defined according to the mechanisms by which they are generated:

1. Blade/Wake Interaction RIN
2. Advancing Blade RIN

Before discussing these two types, a review of rotational noise theory is presented.

2.1 REVIEW OF THEORY

2.1.1 Rotational Noise

Several investigators (References 2, 4, 9, and 17 through 20) have developed theoretical methods for the prediction of rotor rotational noise. The basic assumptions made vary from one to another, but all should accurately predict the noise, presuming sufficient input data are available Most of these methods involve an open-form iterative computer solution. However, Lowson and Ollerhead made several additional simplifying assumptions which allowed them to develop a closed-form solution for far-field rotational noise in terms of Bessel functions (Reference 4). For the purposes of examining RIN, this solution is the least cumbersome and provides the necessary insight to the problem.

Ollerhead and Lowson present the theoretical result for the sound pressure amplitude of the m^{th} sound harmonic due to the steady and fluctuating

forces as the relation

$$
\begin{aligned}
C_m = \sum_{\lambda=0}^{\infty} \frac{i^{-[mB-\lambda]}}{4\pi} \Bigg\{ & \frac{mB\Omega x}{a_o r^2} \Bigg\{ i a_{\lambda T}\left(J_{mB-\lambda} + [-1]^{\lambda} J_{mB+\lambda}\right) - b_{\lambda T}\left(J_{mB-\lambda} - [-1]^{\lambda} J_{mB+\lambda}\right) \Bigg\} \\
& - \Bigg\{ \frac{i a_{\lambda D}}{R r}\left(\left(mB-\lambda\right) J_{mB-\lambda} + [-1]^{\lambda}\left(mB+\lambda\right) J_{mB+\lambda}\right) \\
& - \frac{b_{\lambda D}}{R r}\left(\left(mB-\lambda\right) J_{mB-\lambda} - [-1]^{\lambda}\left(mB+\lambda\right) J_{mB+\lambda}\right) \Bigg\} + \frac{mB\Omega y}{a_o r^2} \Bigg\{ a_{\lambda C}\left(J_{mB-\lambda} + [-1]^{\lambda} J_{mB+\lambda}\right) \\
& + i b_{\lambda C}\left(J_{mB-\lambda} - [-1]^{\lambda} J_{mB+\lambda}\right) \Bigg\} \Bigg\} \qquad (1)
\end{aligned}
$$

where the argument of Bessel functions is $mBMy/r$.

The force components (i.e., $a_{\lambda T}$, $a_{\lambda D}$, $a_{\lambda C}$, $b_{\lambda T}$, $b_{\lambda D}$, $b_{\lambda C}$) are defined by the Fourier summations:

Thrust $$T[\psi] = a_{0T} + \sum_{\lambda=1}^{\infty} a_{\lambda T} \cos\lambda\psi + b_{\lambda T} \sin\lambda\psi$$

Drag $$D[\psi] = a_{0D} + \sum_{\lambda=1}^{\infty} a_{\lambda D} \cos\lambda\psi + b_{\lambda D} \sin\lambda\psi$$

Radial Components $$C[\psi] = a_{0C} + \sum_{\lambda=1}^{\infty} a_{\lambda C} \cos\lambda\psi + b_{\lambda C} \sin\lambda\psi$$

The important fact to note is that all loading harmonics contribute to the noise radiated in each sound harmonic. Thus, it may be expected that increased high frequency airloading harmonics will cause increased levels of all sound harmonics. Lowson and Ollerhead (Reference 4) have shown that loading harmonics of order λ are significant radiators into the m^{th} sound harmonic in the range

$$mB[1 - M] < \lambda < mB[1 + M]$$

Thus, increased high-frequency airloads can be expected to increase the higher sound harmonics more than the lower ones.

The effects of forward speed on the sound field can be accounted for by replacing the term r in Equation 1 by $r(1-M_r)$ where M_r is the component of hub translation Mach number in the direction of the observer (see References 4 and 8). It must be remembered when making this transformation that both r and M_r refer to the 'retarded' position of the helicopter; that is, the actual position of the helicopter when the sound was generated. This substitution also enters the argument of the Bessel function term and can be expected to influence the directivity characteristics of the radiated sound.

2.1.2 Impulse Characteristics

At this point it is necessary to examine the effects of harmonic amplitude and phase on the overall waveform. An impulsive waveform consists of many harmonically related frequencies whose amplitudes decay very slowly with increasing harmonic frequency. This is illustrated in Figure 2 where an impulsive and a nonimpulsive waveform are compared. This figure was prepared by summing the first twenty harmonics assuming only a sine component for each harmonic. For the impulsive waveform, the amplitude of the harmonics dropped off at the rate of 3 dB per octave from the level of the fundamental; for the nonimpulsive waveform, the decay rate was 10 dB per octave. In order to emphasize the full potential impulsiveness of the waveforms selected, all harmonics were shifted 90° with respect to the fundamental. It is readily apparent that the harmonic amplitudes determine the impulsive or nonimpulsive character of the sound. A sharp impulse contains many high amplitude harmonics, while a nonimpulsive sound contains relatively few harmonics of significant amplitude.

Of equal importance in determining the impulsive or nonimpulsive character of a waveform is the relative phasing between the harmonics. This was shown subjectively by Fricke (Reference 10), who found that the detectability of a complex signal was a function of the relative phase between components. The effect of phase on the waveform can be seen in Figure 3. Here the more impulsive of the two signals is the impulsive waveform of Figure 3 (90° phase difference), and the less impulsive waveform is constructed by summing the same twenty harmonics but with all harmonics in phase with respect to the fundamental. The effect of phase on impulsiveness is apparent.

2.2 BLADE/WAKE INTERACTION RIN

Returning now to the two fundamental types of RIN introduced in Section 2.0, blade/wake interaction RIN occurs when a blade passes through or near a wake shed from a preceding blade or another blade in juxtaposition. It results from the rapid pressure fluctuations on the blade as it encounters the velocity variations in the shed wake (tip

vortex). Normally, single main rotor helicopters do not experience this form of blade slap except during conditions of low inflow (e.g., autorotative descent, low power descents, etc.) and certain transient maneuvers. Recently, however, Clark and Leiper (Reference 11) showed that for multibladed single rotors under high lift conditions in hover and some forward flight conditions, a shed tip vortex passes very close under the following blade. In fact, in the presence of flapping or certain wind conditions the vortex may actually pass through or over the following blade. Blade/wake interaction RIN occurs on tandem-rotor helicopters primarily when the shed tip vortices from one rotor pass through the other rotor; thus, in many flight regimes it is a constantly occurring phenomenon.

The effect of high harmonic airloading (resulting from the sharp pressure variations on the blade) on the radiated sound was discussed briefly in Section 2.1.1. The specific effect of increasing the amplitude of the high airloading harmonics may be demonstrated with the aid of the technique presented by Lowson and Ollerhead (Reference 4). They found that in many cases it was possible to present the airload harmonic amplitude drop-off as approximately an inverse power law. That is, the amplitude of the λth airloading harmonic is related to the first harmonic of loading by the relation $L_\lambda = L_1\lambda^{-k}$, where L is a force (thrust, drag, radial component) and k is a constant. Reference 4 indicates the value of k to be about 2.0 for smooth inflow cases and suggests a value of 1.0 for rough running cases, including blade slap. Reference 6 indicates that for severe RIN conditions (blade slap), k should be closer to 0.6 (or 1.1 when corrected for random loading effects, as discussed in Reference 4).

Figure 4 (from Reference 4) demonstrates the effect of the airloading decay laws on the sound harmonic amplitudes for the first twelve harmonics. For a smooth inflow case (k = 2.5), the harmonics drop off at about -9.5 dB per octave, a rate which will produce the nonimpulsive waveform of Figure 2. If, however, the "rough running" value of 1.1 suggested by King and Schlegel is used for k, the harmonics are of equal amplitude and produce the impulsive waveform of Figure 2. Thus, an airloading frequency spectrum containing significant harmonic components to very high frequencies due to blade/wake interaction will result in RIN.

Because of the way in which this type of RIN arises, namely, changing the airloading harmonic distribution, the directionality associated with it should not vary significantly from that expected for a similar non-slap case. This hypothesis can be seen by examining Equation 1. The detailed directionality is determined by the Bessel functions which do not depend upon the value of the loading harmonics. Only the amplitude terms are affected by loading. However, when going to the blade slap case, if the radial components change proportionally more or less than do the thrust and drag components, then gross changes in directionality may be expected.

2.3 ADVANCING BLADE RIN

This form of RIN was originally thought to be due to the formation of weak local shock waves on the advancing blade. As mentioned by Ollerhead and

Lowson (Reference 8) and discussed by Leverton (Reference 5), an observer can hear such a shock wave only if the blade speed is supersonic. If the blade speed is subsonic, the shock wave can not propagate to an observer's ear. However, the formation of local shocks can affect rotor noise levels by influencing the local blade airloading acting on the blade.

Advancing blade RIN as discussed in Reference 8 is basically an acoustic effect resulting from the coalescence of the harmonic wave fronts at high source translational speeds and, in fact, can be explained by the Lowson/Ollerhead theory (Equation 1). Figure 5 (from Reference 8) shows the effect of increasing tip Mach number on sound harmonic levels. As the tip Mach number approaches 1, the higher frequency harmonics increase in amplitude, producing exactly the same effect as the loading changes discussed in the preceding section. Furthermore, at tip speeds close to Mach 1, the fluctuating airloads become unimportant and the noise is controlled entirely by the steady loading.

The highly directional characteristic of advancing blade RIN observed when the helicopter flies directly overhead is also an acoustic effect which results from the forward speed correction made to Equation 1 in Section 2.1.1. Here the term $r(1-M_r)$ which replaces r in the equation enters the argument of the Bessel functions, thus influencing the directivity characteristics. This effect can be seen in Figure 6, taken from Reference 4. As forward speed increases, the radiated sound becomes highly directional in the forward direction, particularly for the higher harmonics. This means that the RIN experienced by a helicopter at high speeds will be radiated preferentially forward with the maximum at about 15-20 degrees below the plane of the rotor. This effect was shown experimentally by Cox (Reference 16) in full-scale wind tunnel tests. Thus, while the acoustic effect of a high tip Mach number is at least partially responsible for the generation of the impulsive noise, the aircraft forward speed accounts for the highly directional character of this type of RIN.

The aerodynamic forces used in current acoustic theory to predict radiated rotational noise are the in-plane (induced drag) and normal (thrust) components of the blade section lift (Figure 7). The profile drag is ignored, since it is small compared to the other terms. When advancing tip speeds exceed a critical Mach number, the drag increases rapidly (Figure 8), a phenomenon known as drag divergence. This increased drag term may be a significant contributor to the radiated noise. In a recent paper, Ardnt and Borgman (Reference 12) examined the effect of drag divergence on the radiated noise. Figure 9, taken from their paper, indicates that the effect of this term is to increase the levels of the higher harmonics of noise, the necessary condition for blade slap. While Ardnt and Borgman indicate that the addition of this term to the Lowson/Ollerhead noise equation enhances correlation, they unfortunately do not show to what degree. For small angles of attack (such as near the tip), the lift term may be quite small and the drag terms will dominate the noise radiation. In this case the associated directivity will be that of a dipole with its maximum directivity in the plane of rotation, thus further contributing to the observed directivity of advancing blade RIN.

An additional factor which may contribute to the observed directivity and character of advancing blade RIN is thickness noise. While it is not significant for highly loaded rotors at low forward speeds, thickness noise can become a significant noise source at high forward speeds. Arndt and Borgman (Reference 12) crudely accounted for thickness noise by applying a forward speed correction to the theory developed by Diprose (Reference 21) for a static propeller. No attempt was made to correct for the nonuniform velocity field over the rotor disk. As Figure 10 (from Reference 12) demonstrates, thickness noise appears to be important only for the first few harmonics of noise; however, as tip speed increases, the levels of the higher harmonics increase quite rapidly. This effect, coupled with the associated directivity pattern, which is the same as for drag divergence generated noise, will tend to enhance the severity of the observed RIN.

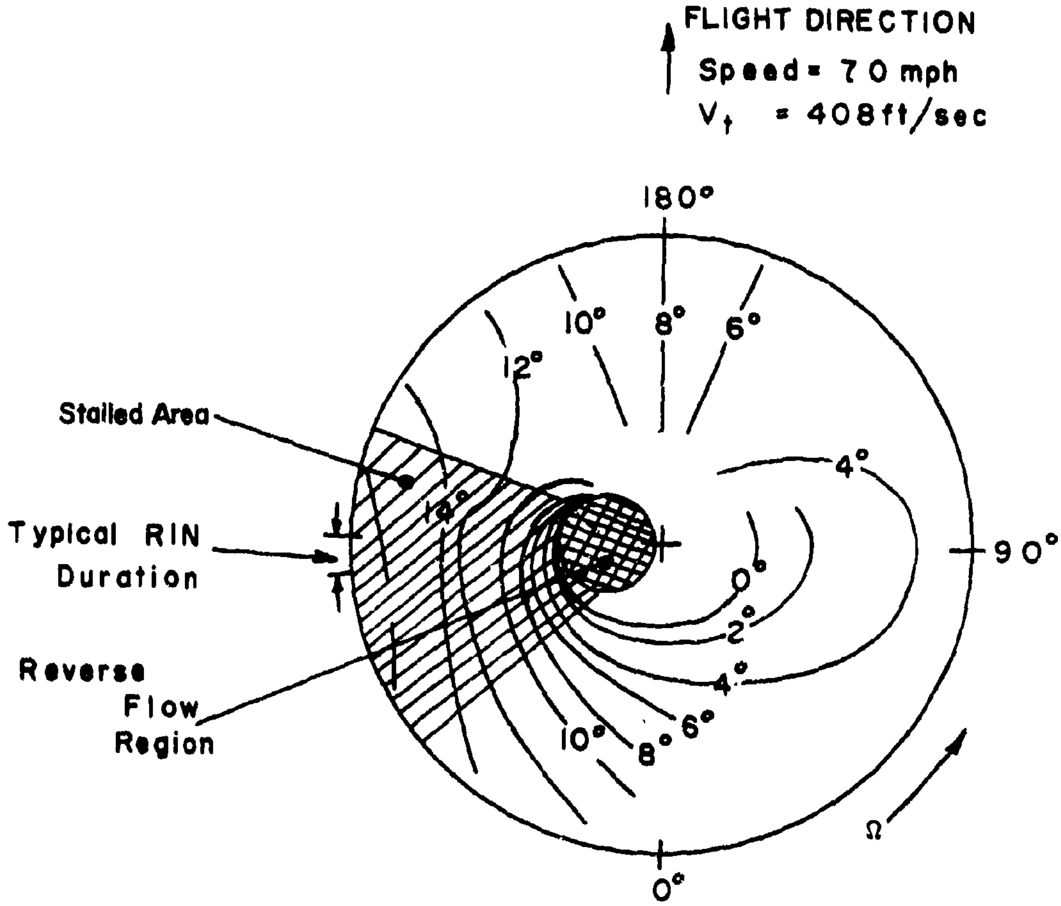


Figure 1. Comparison of RIN Duration With Blade Stall Duration for Single-Rotor Helicopter (Reference 5).

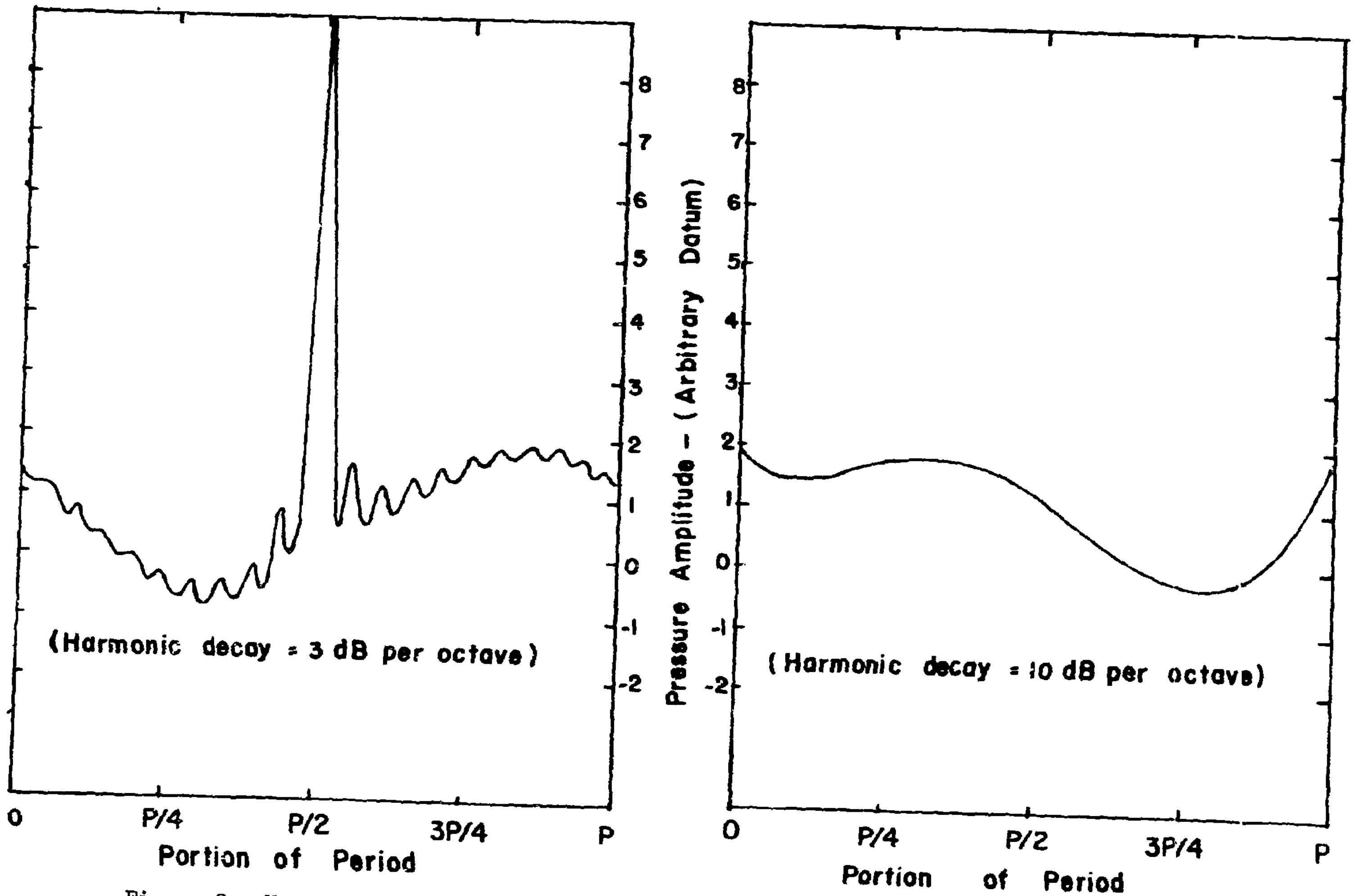


Figure 2. Waveforms Resulting From Summation of First Twenty Fourier Sine Harmonics With Varying Amplitude Decay Rates (Harmonics Shifted 90° With Respect to the Fundamental).

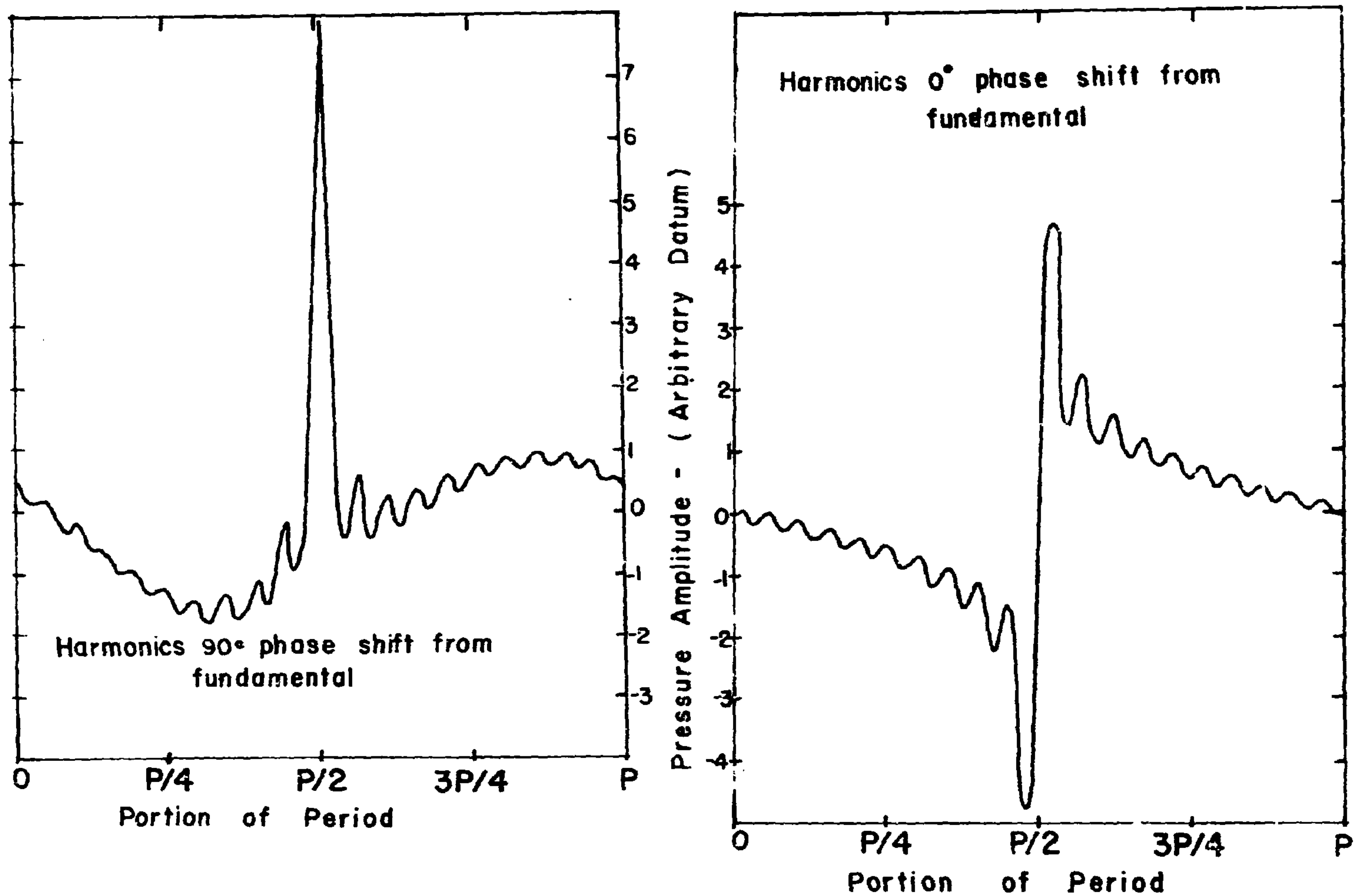


Figure 3. Effect of Harmonic Phase Difference on Pressure Waveform (Harmonic Decay = -3dB per Octave).

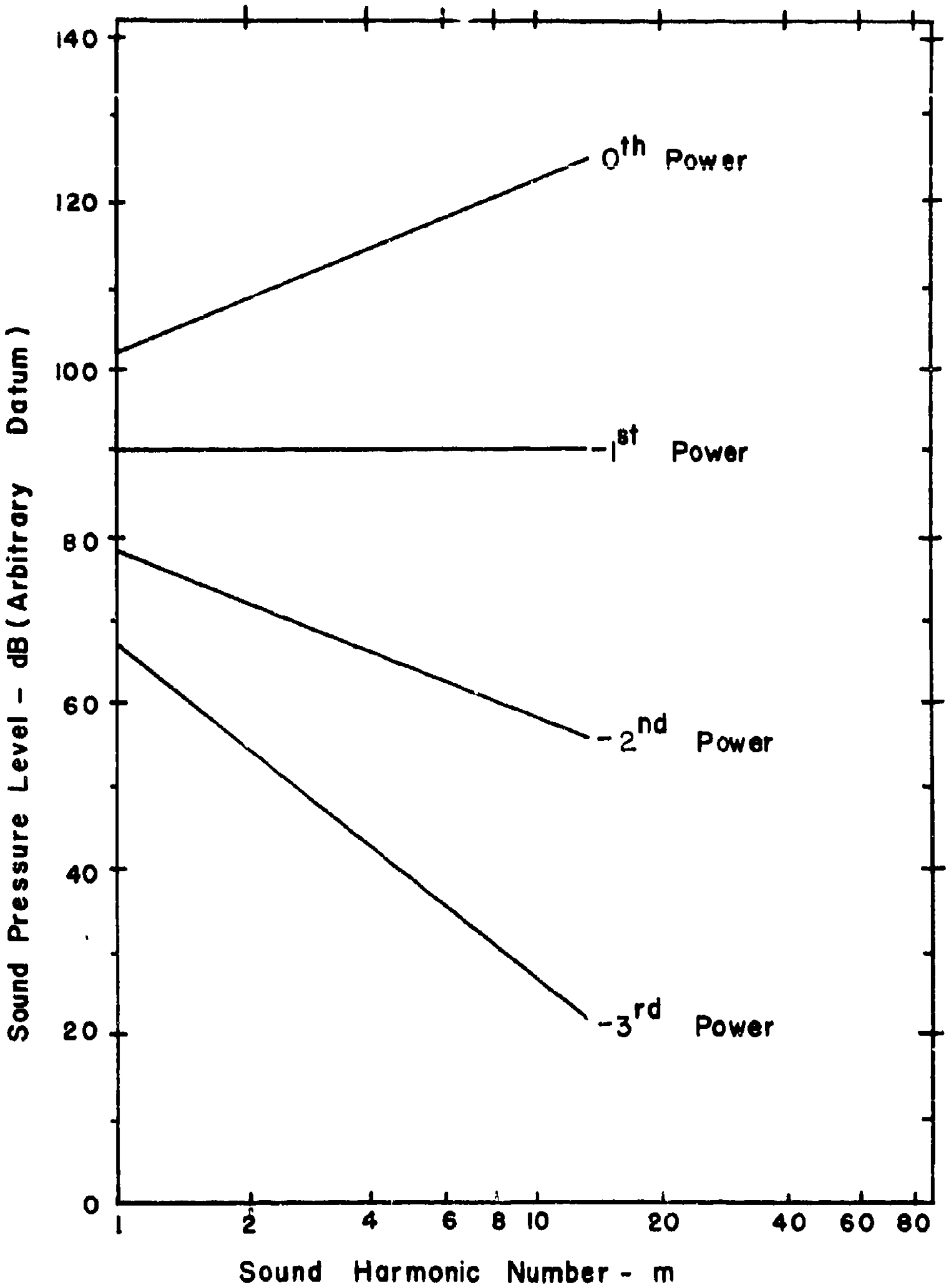


Figure 4. Effect of Airloading Harmonic Decay Power Law on Sound Harmonic Levels (Reference 4).

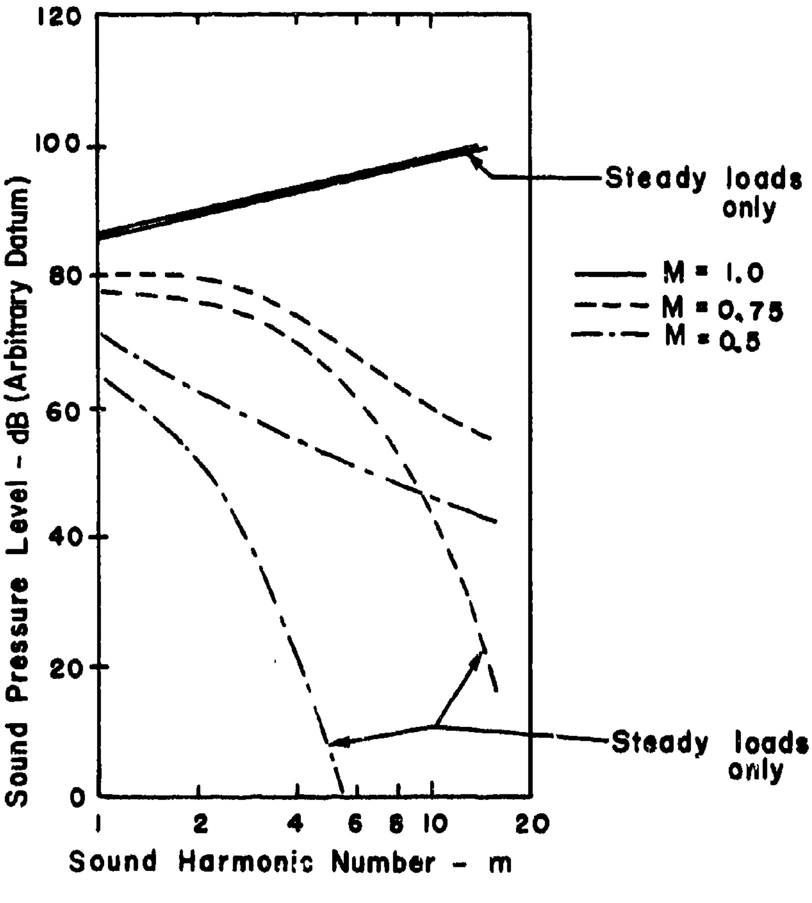
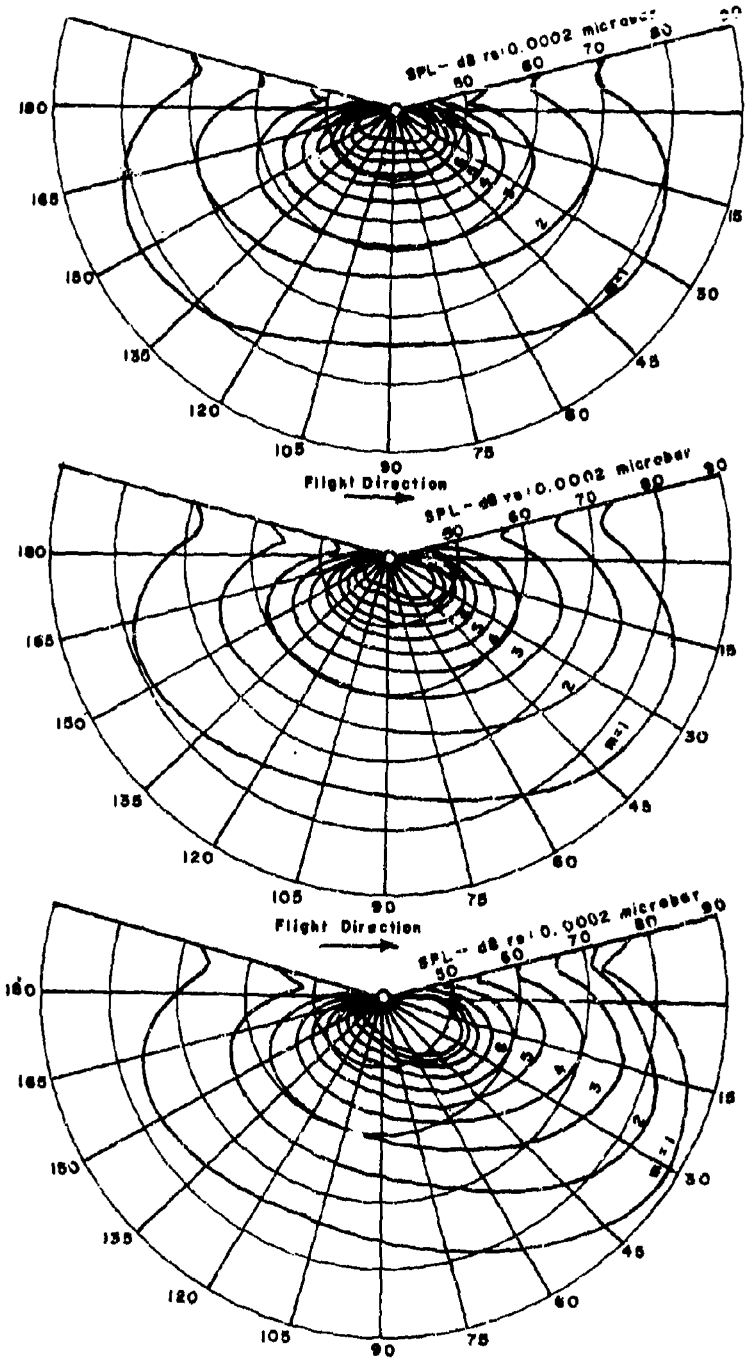


Figure 5. Effect of Rotational Tip Mach Number on Sound Harmonic Amplitude 10° Below Rotor Disk in Hover (Reference 8).

M = 0.5
B = 4
Thrust = 10,000 lb
Dia. = 40 ft
r = 1000 ft



a. Hover

b. Cruise Mach Number 0.125

c. Cruise Mach Number 0.25

Figure 6. Effect of Forward Speed on Radiated Sound Directivity (Reference 4).

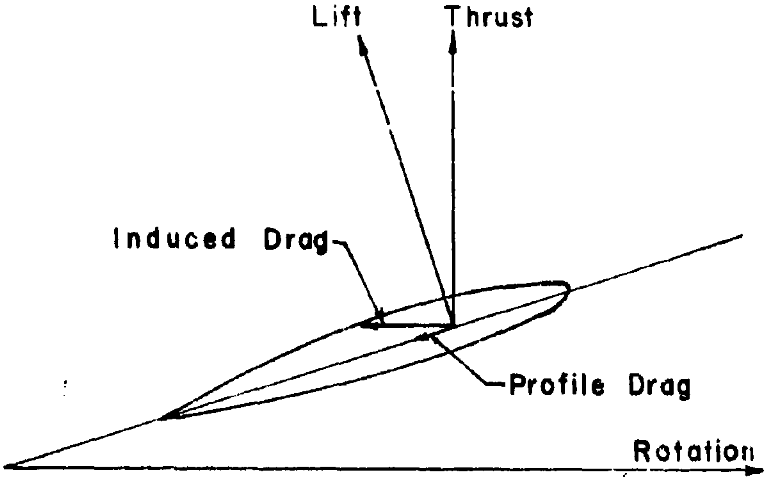


Figure 7. Force Components on Rotor Blade Section.

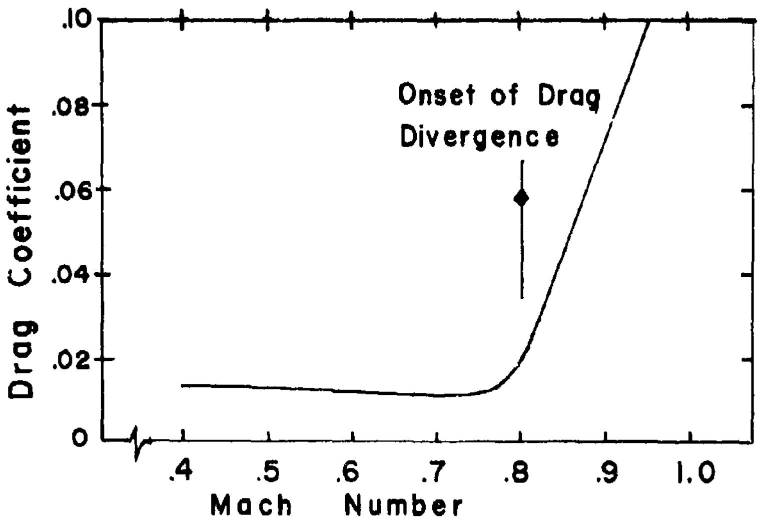


Figure 8. Airfoil Section Drag vs Mach Number for an NACA-0012-34 Airfoil at Zero Angle of Attack (Reference 12).

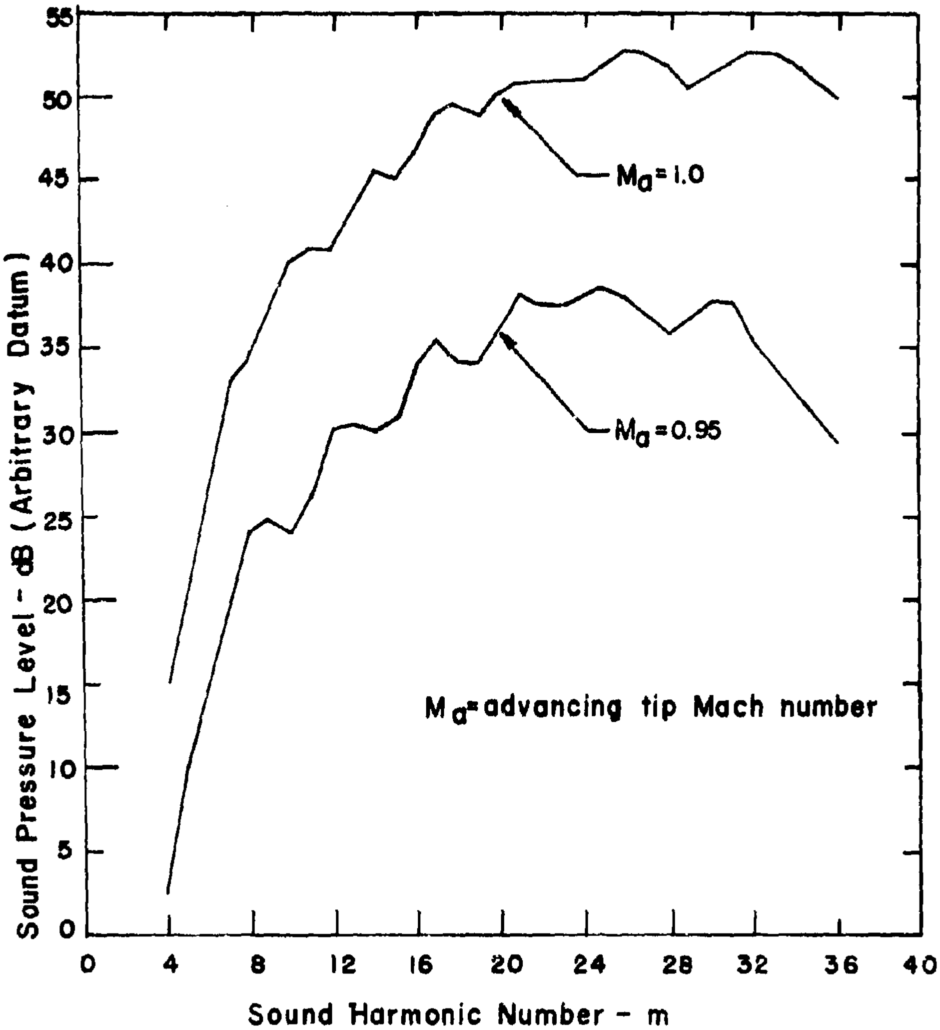


Figure 9. Calculated Harmonic Noise Spectra due to Drag Divergence Effects for a Two-Blade Rotor (Reference 12).

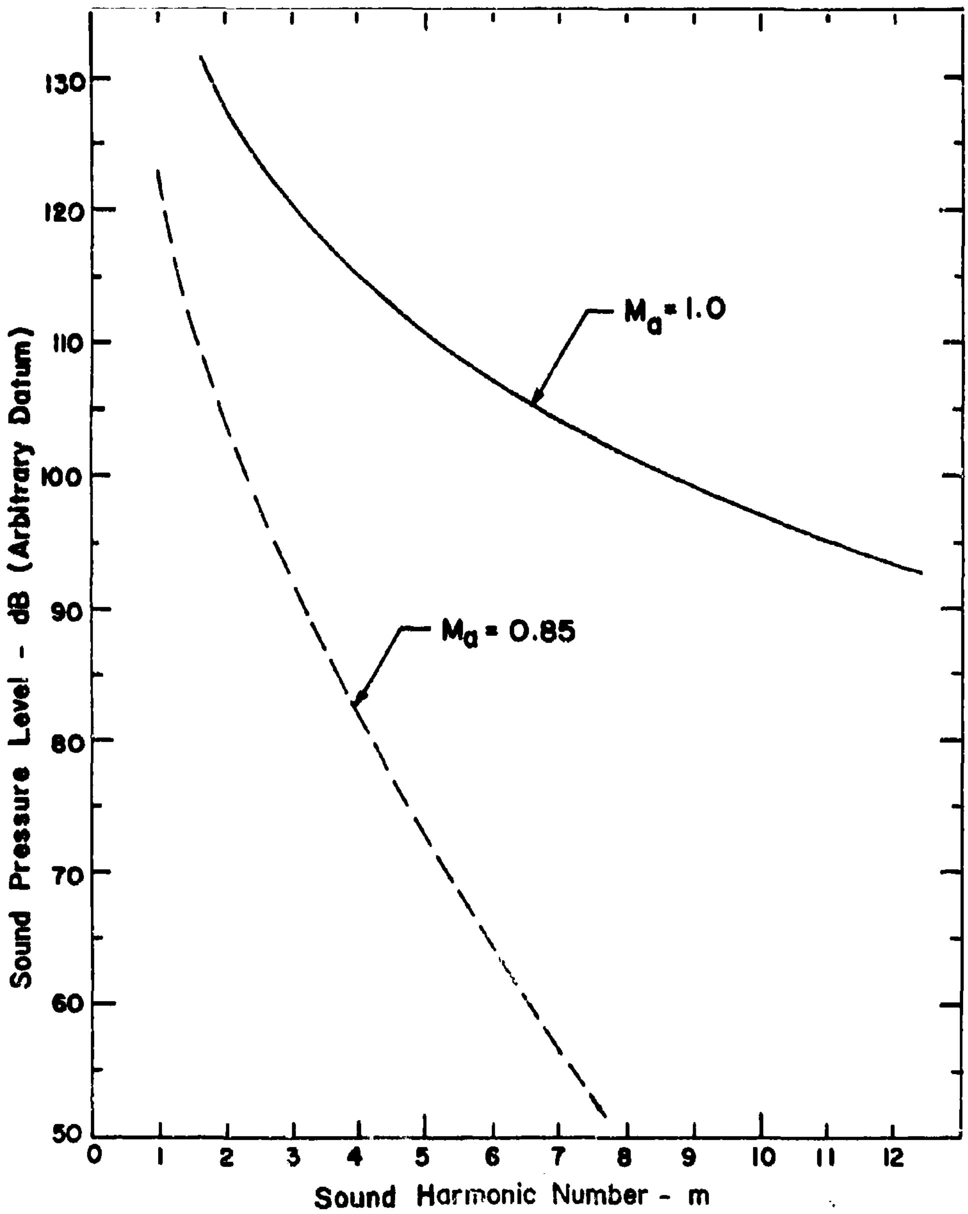


Figure 10. Harmonic Noise Spectra of Thickness Noise for a Two-Blade Hovering Rotor (Reference 12).

3.0 EXPERIMENTAL PROGRAM

The experimental phase of this study involved simultaneous measurement of rotor aerodynamics, rotor blade dynamics, and rotor noise on a CH-53A aircraft, as shown in Figure 11, during hover and forward flight conditions. These data were required for the prediction of impulsive and nonimpulsive rotor noise, for correlation of measured and predicted noise, and especially for the determination of how impulsive rotor noise is aerodynamically generated.

The blade pressure and dynamics instrumentation systems used in this contract were primarily the result of a rotor loads contract which was being run simultaneously. Since bandwidth limitations of the narrowband FM recording system restrict blade pressure measurements to 100 Hz or less, two portable direct record units were added to obtain high frequency pressure data at two chordwise stations (4.2% and 91% chord) near the tip of the blade (98% span). These data would determine whether the accuracy of calculated noise levels would be compromised by the frequency response limitations of the airborne data system. Appendix II discusses these high frequency pressure data.

Noise was measured at three locations inside the helicopter in the hope of locating where acoustic impulses originate in the rotor disk. These data were recorded on the FM system that recorded all rotor dynamics and aerodynamics in order to facilitate correlation of acoustic and aerodynamic data and to utilize the main rotor contactor information for correlation of the acoustic signal with main rotor position.

3.1 FLIGHT TEST

All data for this study were acquired during a flight test on October 15, 1969, at the Bridgeport Airport in Stratford, Connecticut. Noise data were recorded for a series of 14 flyovers and 13 hover orientations. One microphone was located on the centerline of the runway, and additional microphones were located 250 feet to each side of the center microphone perpendicular to the flight path (runway centerline) of the CH-53A helicopter. Forward flight data were recorded during unaccelerated flight from east to west and west to east at an altitude of 1000 feet at nominal airspeeds of 120 knots, 140 knots, and 170 knots. Hover data were recorded out of ground effect (OGE) at 13 helicopter headings at an altitude of 200 feet. Surface winds throughout the test were northerly from 3 to 8 knots. The mean temperature and relative humidity of the air were 50°F and 49%, respectively. Sea level barometric pressure was 30.12 in. Hg.

3.2 INSTRUMENTATION

3.2.1 Data Acquisition

Three data recording systems were used simultaneously during the flight test. An airborne FM multiplex system recorded aerodynamic pressures, blade pitch, blade flapping, blade azimuth angle, and internal noise. An

airborne direct-record system recorded differential pressure data from the fore and aft transducers at the 98% span station. A ground-based FM system recorded the acoustic data for the hover and forward flight test conditions.

3.2.1.1 Airborne FM

The heart of the FM multiplex recording system was an Ampex Model AR 200 recorder set for standard IRIG center frequencies and bandwidths operating at 15 inches per second (ips). Input signals to the recorder were preconditioned by voltage-controlled oscillators. The sensors that measured the aerodynamic and blade motion data were Sensotec (Division of Comtel Corp) pressure transducers and Baldwin-Lima-Hamilton angulators. Figure 12 presents a block diagram of the airborne FM system including the internal noise measurement system.

The microphones used to measure internal noise were housed in metal containers lined with 1-inch thick fiberglass to control reverberation inside the containers and vibration damping material covered the outer surfaces of the containers to prevent acoustic excitation of these surfaces. Each container was mounted in the center of a window as shown in Figure 13 to detect acoustic impulses coming through that window.

3.2.1.2 Airborne Direct

The differential pressures at 4.2% chord and 91% chord from the 98% span location were recorded on this system. In addition to the pressure transducers, the system consisted of two sound level meters and two Nagra portable tape recorders.

3.2.1.3 Ground FM

External helicopter noise was recorded at two locations on the ground with a Lockheed portable tape recorder operating at a tape speed of 15 inches per second. Three information channels were used, two to record noise data and a third to record a time code signal and comments. A fourth data channel had been set up, but the microphone that fed this channel malfunctioned during the flight test. Figure 14 shows the locations of the instrumentation along the helicopter's ground track.

The following procedure synchronized recording of data on the aircraft with recording on the ground and related data recorded on the ground with aircraft location along the flight path. The helicopter pilot radioed a "start" command as the aircraft passed over the end of the runway. This command started both the airborne data recording system and the time code generator on the ground. At this point, data records in the air and on the ground are synchronized, and the location of the aircraft is defined at one instant of time. For easterly flight, the "start" corresponds to a lateral distance of 1000 feet between the microphone array and the approaching helicopter. For westerly flight, this distance is 3700 feet.

3.2.2 Data Reduction

Rotor blade dynamic and aerodynamic data were converted from analog to digital form and then reduced to harmonics of rotor rotation. Data were sampled every 2.5 degrees of azimuth, giving 144 digitized data points for each data cycle from 0 degree to 357.5 degrees of azimuth inclusive. Thirty harmonics then were extracted from the data by performing a Fourier analysis of one typical data cycle for each flight condition. One cycle was used in order to preserve the high-frequency content of the data. This technique was necessary because slight differences between successive cycles cause the high-frequency components in a parameter's time history to be obscured when several consecutive cycles are averaged. The harmonic amplitudes were corrected for the attenuation characteristics of the 60 Hz low-pass filters that were used during the analog/digital conversion. Since all aerodynamic and blade motion data passed through identical filters, no phase corrections were required. A block diagram of the data reduction system is shown in Figure 15.

External noise data were processed into octaves and narrowband form as a function of time. Octave-band analysis involved charting the output of a General Radio Octave Band Analyzer. Narrowband analysis (2.5 Hz) was done with a Saicor Spectrum Analyzer and Saicor Digital Integrator terminating in a Midwestern Oscillograph to produce a 2.5 Hz bandwidth spectrum from 0 to 500 Hz every 0.20 second. Interpretation of the narrowband data was complicated by noise from the tail rotor since the third harmonic of main rotor rotational noise is separated by only 2 Hz from the first harmonic of tail rotor rotational noise. A typical narrowband spectrum is reproduced in Figure 16 to show both frequency content of the signature below 500 Hz and the problem of distinguishing main rotor noise from tail rotor noise.

3.2.3 Instrumentation Response and Calibration

The following section describes the pertinent response and calibration characteristics of each system used to acquire and analyze data. Aerodynamic parameters typically are within ±2% of transducer full scale, and acoustic levels typically are within ±3.5 dB and ±5.0 Hz.

3.2.3.1 Blade Pressure and Blade Motion Measurement System

Sensotec (formerly Scientific Advances) transducers, models SA-SA-M-7F and SA-SD-M-7F, were mounted on one main rotor blade to measure aerodynamic pressures acting on the surface of the blade. Table I contains the range of the transducers and the measurement/analysis system accuracy at each location on the blade. The system accuracy includes all components from transducers on the aircraft to final digital tape and is expressed as a percentage of transducer range. An airtight chamber was placed over each chordwise transducer array so that known pressures could be applied to obtain the response of each transducer. The transducer response measured this way determined values for the electronic R-cals that were made before and after each flight.

Blade pitch angle and flapping angle were measured with Baldwin-Lima-Hamilton angular position transducers, model 236. Pitch angle range was ±60 degrees. flapping angle range was ±30 degrees, and both were linear and temperature compensated over their entire range, giving a system accuracy of ±2% of full scale. Calibration was accomplished by mounting each angulator on an angular position table and recording the output voltage as a function of shaft rotation. Angulator response was determined for both clockwise and counterclockwise rotation of the input shaft to each angulator.

The azimuthal location of the instrumented rotor blade was measured photoelectrically. A metal disc with 72 equally spaced slots was attached to the main rotor shaft. Rotation of the shaft caused the disc to intercept a beam of light aimed at a light sensor, thereby producing 72 pulses per revolution. Accuracy of this signal is better than ±1 degree.

3.2.3.2 Internal Noise Measurement System

The absolute amplitude of the rotor noise measured inside the helicopter was of secondary importance compared to the shape of the acoustic waveforms and the relative phasing among the three internal noise signals. An amplitude reference was supplied for each location, however, with a General Radio Calibrator, model 1562A, that applied a 114-dB signal (±.5 dB) at 1000 Hz (±3 %) to each microphone.

3.2.3.3 External Noise Measurement System

Bruel and Kjaer microphones and amplifiers terminated in a Lockheed tape recorder model 417 operating at a tape speed of 15 ips were used to record external rotor noise. Type 4117 piezoelectric microphones were selected because of their good frequency response characteristics (±3 dB from 3 Hz to 10,000 Hz). A Bruel and Kjaer charge amplifier, type 2624, was connected to the output of each microphone to permit the use of long connecting cables. This charge amplifier's response is ±.4 dB from 5 Hz to 10,000 Hz. A noise limit indicator, type 2211, was inserted between each charge amplifier and the tape recorder to insure that the level of the input signal to the tape recorder stayed within acceptable limits. Response of this instrument is ±1.2 dB from 2 Hz to 35000 Hz, and tape recorder response is ±2 dB from 0 Hz to 5000 Hz. The complete system was calibrated at 114 dB with a General Radio calibrator, type 1562A, at frequencies of 125 Hz, 250 Hz, 500 Hz, 1000 Hz, and 2000 Hz. Indication of elapsed time and compensation for flutter and wow were accomplished by connecting a Systron Donner time code generator to a separate track of the tape recorder. Amplitude accuracy of the total noise recording system is estimated to be ±3 dB, while the worst possible accuracy, obtained by summing the deviations of each component, is ±7 dB.

Rotational noise data were analyzed with a Saicor spectrum analyzer, model 31A, and a Saicor digital integrator, model 21A. These instruments were calibrated with built-in references and checked with peripheral equipment whose accuracy is traceable to the National Bureau of Standards. Accuracy of the noise analysis equipment is ± .2 dB and ± 2.5 Hz. Accuracy of the total acoustic measurement/analysis system is estimated to be ± 3.5 dB, ± 5.0 Hz.

TABLE I. PRESSURE TRANSDUCER LOCATION, RANGE, AND ACCURACY

PERCENTAGE CHORDWISE	PERCENTAGE SPANWISE 40 – 75 – 85 – 95	98
4.2	3-18 PSIA (40–95)	±10 PSID
	VIBRATORY ±2% (40–98)	
	STEADY ± 2% (40–98)	
15.8	3-18 PSIA (40–95)	±10 PSID
	VIBRATORY ±2% (40–98)	
	STEADY ±2% (40–98)	
30.0	3-18 PSIA (40–95)	±10 PSID
	VIBRATORY ±2% (40–98)	
	STEADY ±2% (40–98)	
60.0	±2 PSID (40–98)	
	VIBRATORY ±2% (40–98)	
	STEADY ±3% (40–98)	
91.0	±2 PSID (40–95)	+5 PSID
	VIBRATORY ±2% (40–98)	
	STEADY ±3% (40–98)	

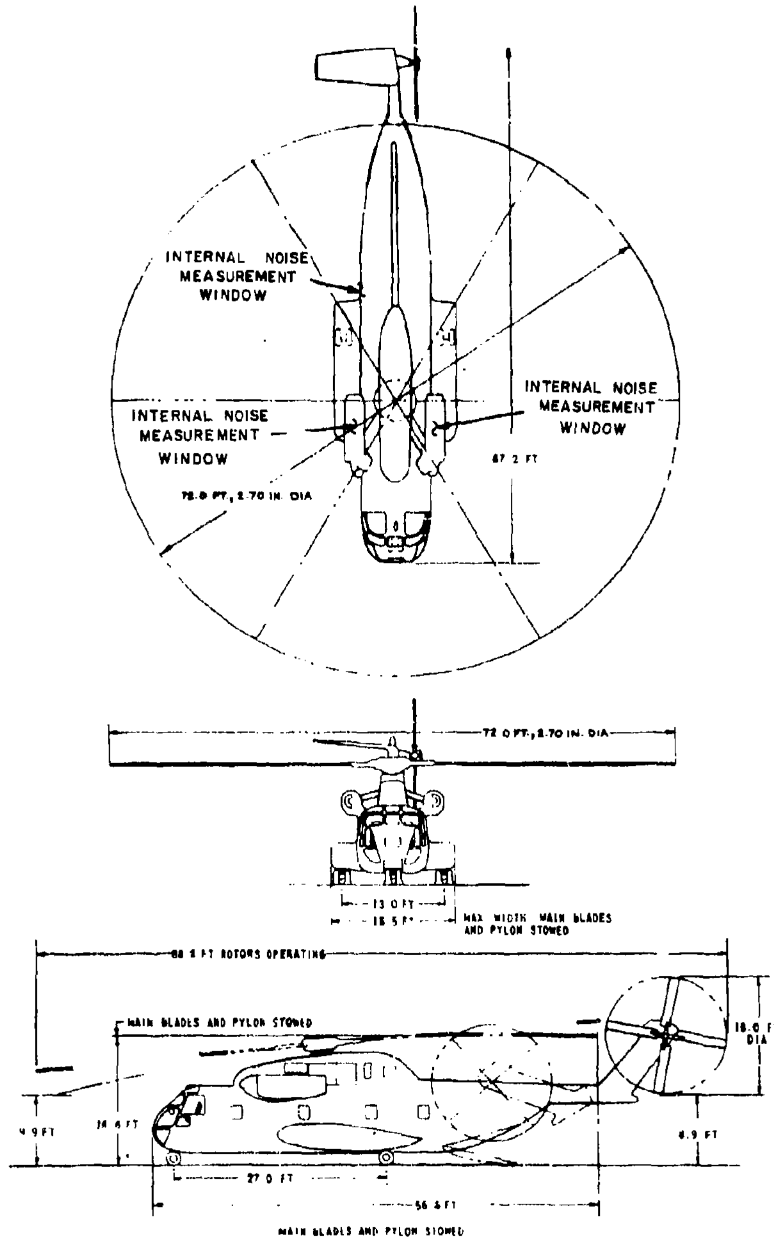


Figure 11. CH-53A General Arrangement.

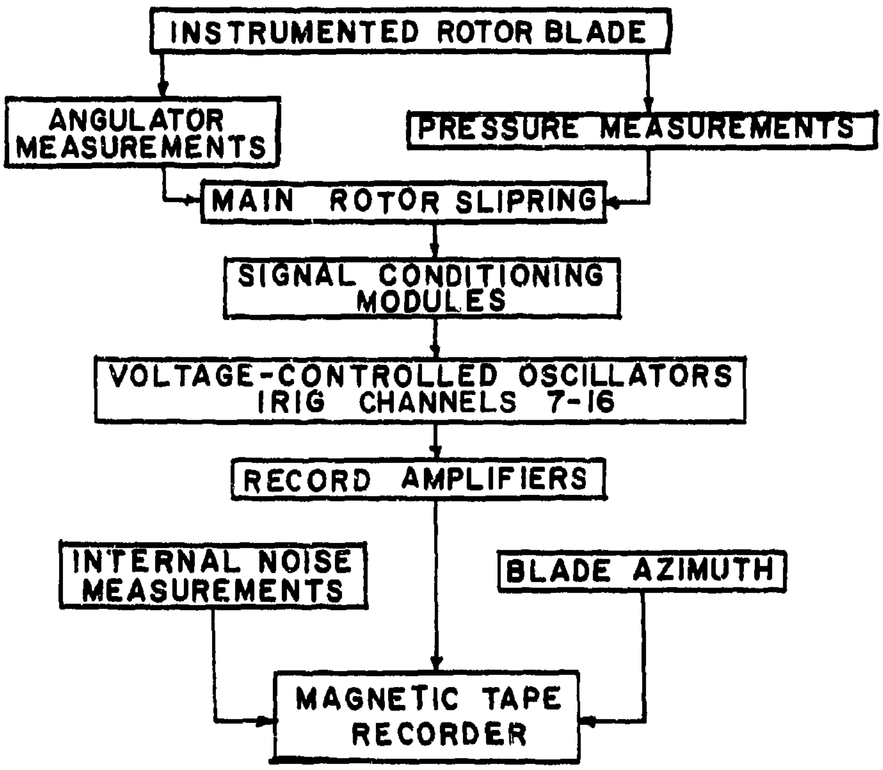


Figure 12. Airborne Data Acquisition System.

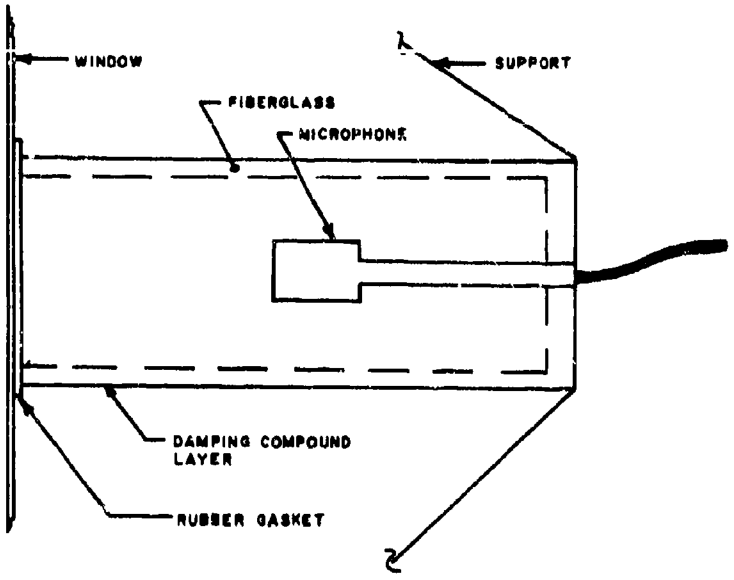


Figure 13. Internal Noise Microphone Installation.

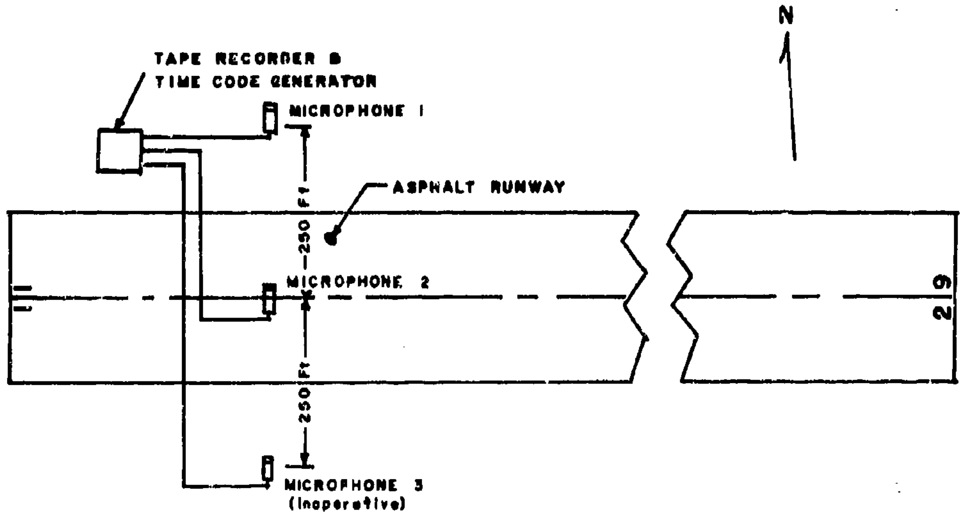


Figure 14. Ground-Based Data Acquisition System Layout.

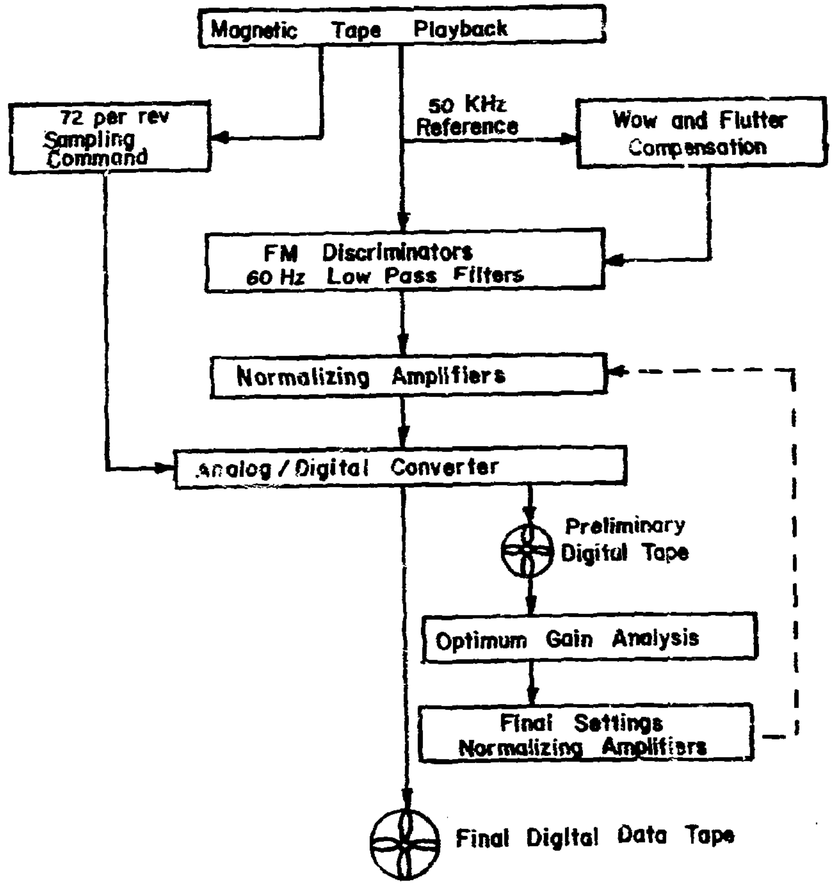


Figure 15. FM Data Reduction System

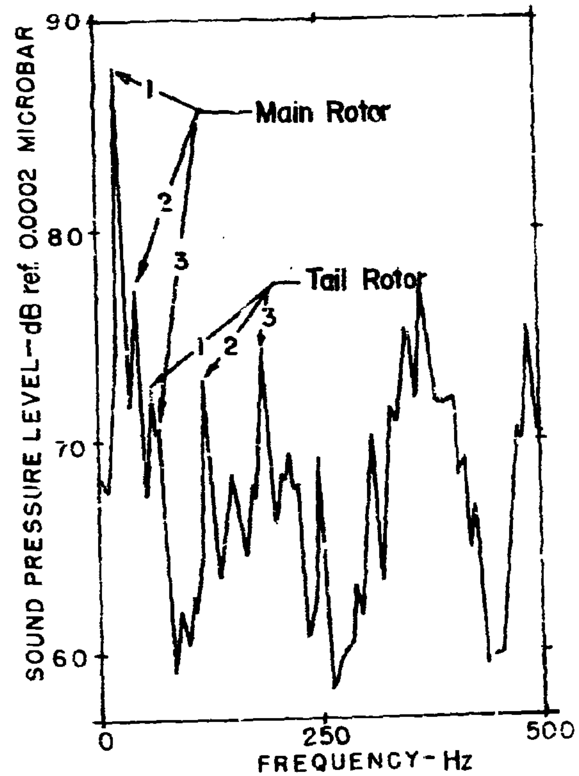


Figure 16. Typical Narrowband Spectrum of CH-53A Helicopter Noise, 170 Knots, 380-Foot Lateral Distance.

4.0 RESULTS

The present study seeks to define some of the characteristics of RIN and to determine how well these characteristics are predicted by the rotational noise analysis described in Reference 13. The present study also evaluates the ability to predict rotational noise levels from theoretical airload data. Section 4.1 describes the calculation procedures and correlation for rotational noise, and Section 4.2 investigates the aerodynamic noise generating mechanisms found in the CH-53A flight test data.

4.1 ROTATIONAL NOISE CORRELATION

The two qualities of rotational noise that determine the impulsiveness of the total rotor noise signature are harmonic amplitude fall-off and relative phasing among the noise harmonics. Comparison of measured and predicted root-mean-square sound pressure levels (SPL's) determined amplitude correlation, while comparison of measured and predicted time histories of acoustic pressure determined phase correlation. Predicted time histories are based on measured aerodynamic load data.

Time histories of acoustic pressure were not calculated from theoretical airloads. Experience has shown that currently available airload/blade response analyses predict amplitudes fairly well but predict phase behavior poorly even when variable inflow velocities for helical wake geometry are added to the calculations. Since the airload phasing can significantly affect calculated noise levels (Reference 4), it was decided that no new information would result from using theoretical airloads to calculate time histories of acoustic pressure.

4.1.1 Hover Noise

The most impulsive noise signature heard during the flight test occurred during hover out of ground effect. This RIN was caused by the main rotor blades cutting through wakes from tail rotor blades, a phenomenon which requires a quartering tail wind in order to occur during hover. Noise levels calculated from measured airloads reflect this blade/wake interaction, but levels calculated from theoretical hover airloads do not, since the airload prediction analysis considers only aerodynamics of the main rotor and does not simulate interactions of main rotor blades with tail rotor wakes.

4.1.1.1 Correlation Using Measured Hover Airloads

Calculated and measured SPL's agree fairly well through the fifth harmonic. In theory, 5 noise harmonics are all the analysis should calculate with confidence from 30 harmonics of airload for a 6-bladed rotor. Both calculated and measured noise levels changed radically with small changes in azimuthal position around the helicopter. Unfortunately, the azimuthal resolution of the measured noise data is insufficient to verify all the calculated variations around the hovering helicopter. To obtain this information, a circular array of microphones surrounding the helicopter would have been required. Since the instrumentation for such an approach was not available, hover noise data were recorded with one microphone on the runway centerline while the helicopter heading changed in 30-degree increments to achieve an

azimuthal traverse. The helicopter hovered 500 feet west of the microphone array at an altitude of 200 feet above the runway centerline. Some hover noise data also were recorded using the microphone 250 feet north of the runway centerline. The two microphones are roughly 26 degrees apart in terms of helicopter azimuth. Data from the sideline microphone has been corrected for the difference in distance caused by the right-triangle geometry setup of the hover test. Noise level changes due to directionality were ignored in this correction since the difference in elevation angle (angle between microphone, rotor hub, and horizontal) is approximately 2 degrees.

Plots of the azimuthal variation in calculated SPL are presented in Figures 17 through 19. The airload data used to generate Figure 17 do not correspond to RIN conditions, whereas the data for Figures 18 and 19 are associated with RIN. A measured SPL value is shown for each harmonic at the appropriate azimuth relative to the helicopter (zero azimuth is at the tail of the helicopter); it can be seen that predicted and measured levels generally agree within 10 dB, depending upon harmonic order and helicopter heading. The 5th harmonic in Figure 19 is an exception since the measured SPL is roughly 20 dB below the calculated SPL. A complete assessment of prediction accuracy - that is, SPL and directionality in vertical and horizontal planes - is beyond the scope of this study.

The calculated variation in SPL around the azimuth raised questions about the validity of the noise prediction computer program. Assuming that the airloads are fairly steady during RIN-free hover, the resultant rotational noise fundamental should radiate uniformly in all directions. A noise calculation using steady airloads resulted in a constant fundamental level around the azimuth. It is concluded that the computer program functions correctly, and that the calculated levels in Figure 17 vary azimuthally because of wind-induced asymmetric airloads. Cyclic changes in blade pitch are a secondary contributor to these calculated variations. For the hover conditions that produced moderate and pronounced RIN, the calculated variations are attributed to asymmetric loading due to wind effects and blade/wake interactions. The noise harmonic spectra shown in Figure 20 illustrate calculated and measured noise variations in a 26-degree azimuth increment. The calculated time history of acoustic pressure also can change radically with azimuth, as can be seen in Figure 21. Differences were observed in the two noise recordings taken for this helicopter heading, but the azimuthal spread was not sufficient to confirm the extremely impulsive signature calculated on the starboard side of the helicopter.

4.1.1.2 Correlation Using Theoretical Hover Airloads

In order to evaluate the ability to predict noise without airload information measured in flight, levels for 3 noise harmonics were calculated from theoretical rotor airloads. The results of this exercise confirm that accurate noise prediction is not presently possible for more than the fundamental using theoretical airloads. The theoretical airloads are restricted to too low a frequency range (typically 5 or 6 times the rotor hub rotational frequency), and the accuracy of the theoretical airload phasing tends to be unacceptable for acoustic prediction work. Existing rotor load analyses

of the prescribed wake/variable inflow/normal modes type used during this study are adequate for investigations of rotor and fuselage dynamics, but not for detailed acoustic studies.

Theoretical airloads were calculated using a variable inflow analysis to describe the air velocity distribution over the rotor disk for a given trim condition. The wake of each rotor blade is assumed to descend in the form of a helix from the rotor plane. The rotor trim condition is determined by a rotor blade dynamics analysis that uses the normal modes approach to calculate the loads on the blades and the response of the blades to the impressed loading. If inclusion of variable inflow changed the trim condition too much, the rotor was retrimmed with the variable inflow velocities included, new inflow velocities were calculated for the latest trim condition (control angles and blade motions), and the process was repeated until a converged answer was obtained.

Noise levels calculated from theoretical hover airloads are shown in Figure 22 along with noise levels measured for the RIN-free case. Slight azimuthal variations in the calculated fundamental SPL are caused by small higher-harmonic airloads. The variations shown for the calculated 2nd and 3rd harmonics have the same cause, but these variations are larger because the airload harmonics are more efficient acoustically for the higher noise harmonics. While the theoretical hover airload harmonics are sufficiently large to produce variations in the calculated noise fundamental, they are not large enough to give good agreement between calculated and measured noise harmonics above the fundamental.

4.1.2 Cruise Noise

Correlation between calculated and measured rotational noise levels during forward flight ranged from good to fair for the first three noise harmonics. Calculated fourth and fifth harmonic levels tended to be from 5 dB to 10 dB higher than measured within 1000 feet of the helicopter. At larger distances, measured levels tended to be higher than calculated. These results suggest that calculated directional characteristics place maximum radiation of the harmonics too far below the plane of the rotor. Including the effects of rigid-body blade coning and flapping motions on calculated directionality changed levels only by 1 to 2 dB on the average, and this difference tended to decrease calculated noise levels at large distances in front of the helicopter.

Calculated time histories of acoustic pressure reflected trends in measured data. During high-speed cruise at an altitude of 1000 feet, neither the calculated nor the measured time history sounded or looked impulsive at large distances ahead of the helicopter. As the helicopter drew closer, both measured and calculated time histories became more impulsive. Section 4.2 contains additional information on measured characteristics of high-speed RIN.

4.1.2.1 Correlation Using Measured Cruise Airloads

Measured and calculated harmonic noise levels are plotted against noise

origin location in Figures 23 through 25. Each point on the graph gives the noise harmonic level that originated at location, (X, Y, Z). These calculated SPL's include the effects of rotor shaft inclination and blade flapping and coning. Calculated SPL's are shown for lateral distances from 2000 feet to zero feet as the helicopter approaches. Measured SPL's are shown for lateral distances at which the first 5 noise harmonics are well defined. Consequently, the x-axis range of measured noise data varies from one flight condition to another. Since levels for port and starboard sides were obtained by passes in opposite directions at a given nominal airspeed, some acoustic differences between sides are from normal directivity associated with asymmetric airloads while some are from differences in airload amplitude and phase due to slight variations in aircraft trim and atmospheric turbulence between passes. Variations of calculated SPL with x-axis location reflect the effects of airload amplitude and phase on calculated directionality.

A major feature of the correlation presented in the figures is the consistently low calculated SPL at large distances ahead of the helicopter. Similar results were obtained in Reference 15, and an explanation offered at that time was that the orientation of the rotor system with respect to the ground should be included in the acoustic analysis. Consequently, the assumption of a flat rotor disk parallel to the ground was removed during the present study by adding shaft inclination and blade flapping and coning terms to the analysis (see Appendix I for analysis). As shown in Figure 26, the acoustic effect of these terms is small, even during high-speed cruise when forward shaft inclination and blade flapping are largest for a conventional (non-compound) helicopter. Reconsidering the problem in the light of these results, it appears that acoustic effects of forward flight must be included for improved correlation far in front of a rotor travelling at high speeds. These forward speed effects enter the problem both in the theory and in the airload data that are used with the theory Theoretically, the helical motion of a point acoustic source attached to a blade must be coupled with relative translational Mach number effects. Helical source trajectories were beyond the scope of the present study, but simulation of relative translational Mach effects was accomplished using a coordinate transformation proposed by Lowson and Ollerhead in Reference 4. The X, Y, and Z coordinates of each observer location were multiplied by $(1-M_r)$, where M_r is the component of the hub translational Mach number in the direction of the observer. This transformation effectively reduces the propagation distance between noise source and observer to increase the calculated noise levels by the amounts shown in Figure 27. Results obtained by recalculating noise with modified observer coordinates match results obtained by scaling originally calculated levels by $20 \log_{10} (1/(1-M_r))$, thereby confirming that hub translational motion alone does not alter relative phasing among the acoustic sources that define the rotor as a noise generator. In terms of aerodynamic effects, profile drag forces increase rapidly with forward speed, thereby augmenting forward-radiated noise.

The effect on calculated SPL of simulating an impulsive chordwise distribution of airload also was investigated briefly. The section lift force (pounds per inch of span) was concentrated over 10% of the blade chord. This is the same as increasing differential pressure by a factor of 10 and decreasing the area upon which it acts by the same factor. For this investigation, the pressure amplitude was constant across the chord. When a blade with this modified chordwise loading passes over a point in the rotor disk, that point experiences a pressure pulse whose amplitude is 10 times normal and whose duration is 0.1 times normal; that is, the loading is more impulsive. As can be seen in Figure 28, the more impulsive load changes calculated noise levels by only 1 to 2 dB. This result is not surprising since results of Reference 15 suggest that the lower harmonics of rotational noise are relatively insensitive to changes in chordwise distribution if high-frequency airload data are used in acoustic calculations.

Variations in correlation between different flight conditions are attributed to the effects of wind gusts and turbulence on both aerodynamic and noise data. Although the surface wind velocity was below 10 mph for most of the data acquisition period, the pilots reported considerable turbulence and wind gusts at the 1000-foot flight altitude. These unsteady conditions are believed to be the main cause of the time variations in measured noise over short time intervals as well as the cause of variations in measured rotor aerodynamic data.

Some aspects of the correlation between measured and calculated time histories of acoustic pressure are shown in Figure 29. At distances over 2000 feet, neither the measured nor the calculated time history appears impulsive (Figure 29a). As distances decrease to between 500 and 1000 feet, both signatures become more impulsive on the advancing blade side of the flight path (Figure 29b). Typical measured and calculated time histories for 140-knot flight are shown in Figure 29c, where the shape of the acoustic waveform is consistent with the subjective observation that RIN was not heard during flybys at 140 knots.

4.1.2.2 Correlation Using Theoretical Cruise Airloads

The same analytical techniques that were used to predict hover airloads were used to predict cruise airloads. Iterations between inflow and rotor response analyses were continued until the correct rotor lift and propulsive forces were obtained (±10%) with head moments less than 10,000 ft-lbs. Results presented in Figures 30 through 32 show again that correlation decreases rapidly with increasing noise harmonic order.

4.1.3 Conclusions of External Noise Correlation Study

The correlation study demonstrated that the open-form acoustic analysis can calculate certain qualities of rotational noise from measured airload data, such as the SPL of the first 3 noise harmonics at moderate distances from the helicopter and the qualitative differences in acoustic pressure waveforms with and without RIN. The study also demonstrated that inclusion of rotor orientation in the acoustic analysis does not significantly improve correlation. The authors currently believe that source motion effects

must be included in the acoustic analysis in order to improve correlation far in front of a high performance helicopter. In addition to including motion of the acoustic sources, it is particularly important to include the effects of compressible aerodynamics on the airload data that are used for noise calculations. Specifically, the aerodynamic forces in the plane of the rotor due to profile drag may strongly influence calculated acoustic directionality. The present analysis considers only induced drag effects on in-plane aerodynamic forces.

4.2 IMPULSIVE NOISE SOURCE LOCATION

Triangulation using the 3 microphones inside the cabin of the helicopter was employed to locate the position(s) in the disk responsible for the generation of impulsive noise. Successful use of this procedure relies on two basic requirements:

1. That impulses be observed at all three microphone stations.

2. That a given impulse be identified at all three microphone stations.

If either of these requirements is not met, the triangulation procedure will not be useable. Furthermore, a very accurate time base relating the three microphone signals must be used because variations of only 0.0001 second in time-of-arrival differences can cause errors of up to 10% in the location of the sources.

Examination of the microphone oscillograph pressure traces (Figure 33) revealed that for both hover and forward flight RIN, the first requirement was not met. In fact, in forward flight there was no discernible impulsiveness in any of the microphone signals, and in hover only the forward left side microphone (and to some extent the forward right microphone) showed impulsiveness. In both cases the aft right microphone was completely dominated by tail rotor rotational noise. Attempts to filter out these tail rotor components did not correct the situation, due primarily to the unavailability of a very narrow bandwidth, high attenuation band elimination filter.

These problems resulted in the use of an alternative method to locate the source areas. This method involved specifying the position of the rotor at the instant the impulse was generated and using the measured airloads to determine the blade responsible for the slap. However, since no impulse was discernible for the forward flight case, this method is applicable only to the hover case.

4.2.1 Hover

In hover, RIN conditions were encountered only for certain aircraft headings with respect to the wind. Continuous RIN was experienced only when the helicopter was on a compass heading of 270° (wind from heading 030°). At this heading the wind was sufficient to blow the tail rotor wake into

the main rotor disk, causing blade/vortex interaction RIN; thus, the impulse noise source area is expected to be in the quadrant 270°-360° (re: helicopter azimuth; 0° - 360° = tail). For other headings, RIN was not present, except at 210° and 240° where it was intermittent.

Examination of the noise recorded by the forward right and left interior mounted microphones (Figure 33) reveals that the intensity (severity) of the RIN is greatest at the left microphone, confirming that the RIN is indeed produced on the left side of the aircraft. Figure 34 shows that airloads near the tip (section load, pounds per inch of span) change in a smooth, gradual manner as the blade travels around the azimuth, except for the region from about 270° to 360° azimuth where the blade experiences rapid fluctuations in lift (loading) due to interaction with the tail rotor's shed wake. It is this rapid lift fluctuation that generates the high-amplitude, high-frequency airloading harmonics which, in turn, are responsible for the generation of RIN. Figure 34 also shows the azimuthal loading distribution for the no-RIN hover. There are no rapid changes in lift to increase the high-frequency airloads, and the general shape of the airload spectrum is quite different from the RIN case.

The harmonics of airloading are derived by performing a Fourier analysis of the waveforms shown in Figure 34 where the period is equal to one revolution. The pulse shape for the RIN case approximates a rectangular pulse with some modification due to the vortex intersections, and the no-RIN case is a rectangular pulse with a slow rise time. A Fourier analysis of these pulses should yield a harmonic amplitude spectrum which resembles that of a rectangular pulse (Figure 35). Figure 36 shows this to be the case. This figure also shows the expected increased levels of the high frequency airloads for the RIN case.

No changes were detected in the chordwise distribution of differential pressure when the instrumented main rotor blade passed through wakes from the tail rotor, and no significant differences were observed during hover with and without RIN. Figure 37 shows a family of pressure distributions in 2.5-degree increments from an azimuth angle of 305 degrees through 325 degrees. These pressure profiles correspond to the section loading data for the RIN case shown in Figure 34. Pressure distributions for hover conditions with and without RIN are presented in Figure 38 to show that distribution shape is not influenced by RIN. The RIN condition corresponds to a helicopter magnetic heading of 270 degrees, while the RIN-free condition corresponds to a magnetic heading of 030 degrees.

Further indication of the location of the impulse generating area is given by determining the location of the rotor at the instant the RIN is generated. This location is found through use of the 1-per-rev contactor channel recorded on the same tape as the internal microphone data. Examination of the recorded data shown in Figure 33a revealed that for one revolution of the instrumented blade, six impulses were recorded by the microphones (each blade passing through the tail rotor wake). Figure 39 illustrates the range of rotor locations at time of impulse for three revolutions of the blades (eighteen impulses). This range is found to be from about 300° to 325° azimuth, which agrees with the pressure traces of Figure 34. It thus

seems reasonable to assume that the RIN observed on the CH-53A during hover is due to main rotor blade/tail rotor wake interactions which occur at azimuth 300° - 325°. This RIN is observed at the two forward internal microphone stations, but is masked by tail rotor noise at the aft right microphone station.

4.2.2 Forward Flight

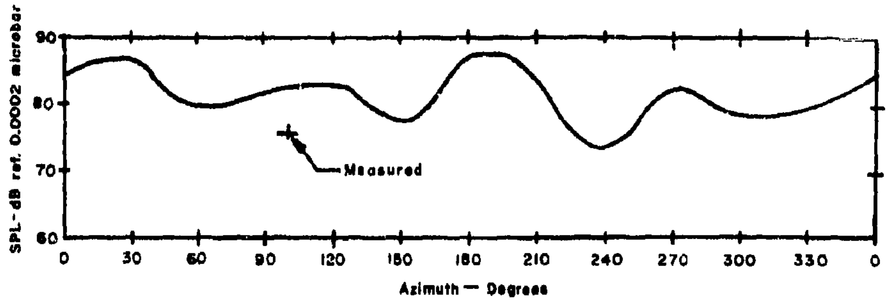
RIN was observed during forward flight only at high speed (170 kt). Observers on the ground noted that this form of RIN was highly directional and could be heard only during approach at large helicopter to observer distances where the angle of the observer below the rotor disk is small. As the helicopter approached and the angle became larger, the impulse could no longer be heard. Based on the directionality arguments presented in Section 2.3, this is not an unexpected observation. Simultaneous measurement of noise along the ground track and 250 feet to the side provided additional information on directional characteristics of forward-flight RIN. The acoustic signature directly ahead of the helicopter reached its maximum impulsiveness several seconds earlier than the signature 250 feet to the side of the flight path. The noise data exhibited mild RIN on the retreating blade side of the helicopter. Figure 40 illustrates the characteristics described above for the centerline microphone and advancing blade side microphone (flight from east to west). Note the impulsiveness of the centerline signal compared to the advancing blade side signal in Figure 40a, corresponding to a helicopter location over 2500 feet away. Figures 40b through 40d bring the helicopter nearly overhead. Figure 41 shows the two noise signals for flight from west to east, with 41a representing maximum impulsiveness on the retreating blade side of the aircraft. Comparison of the upper trace of this figure with that of Figure 40c shows the RIN on the retreating blade side to be less severe than on the advancing blade side. Figure 41b corresponds to the helicopter passing over the microphone array. For comparison, Figure 42 presents the most impulsive-looking signal recorded during 140-knot flight from east to west. Acoustic rise times are not short enough to produce RIN in this case.

Oscillograph traces of the noise recorded by the internal microphones (Figure 33b) showed no impulsiveness at the two forward stations. The aft microphone was completely dominated by tail rotor noise, and filtering the signal did not improve the situation. The fact that the impulse was not recorded by the internal microphones is to be expected, as can be shown by reference to Equation 1 (Section 2.1.1). The replacement of r by r $(1-M_r)$ to account for the effect of forward speed on the sound heard by a stationary observer reverts to simply r if the observer is moving with the helicopter. Thus, the acoustic effect of forward-flight RIN is not applicable to an observer on the helicopter. Some aerodynamic phenomenon, such as blade/wake interaction or compressibility-induced loading oscillations, must occur to cause RIN that can be detected inside the helicopter. Airload data do not show blade/wake interactions, so compressibility effects are left as the source of high-speed RIN that can be heard in the moving reference frame. Compressibility increases in-plane forces more than out-of-plane, which increases in-plane components of rotational noise. This will increase the first two or three rotational harmonics slightly inside the

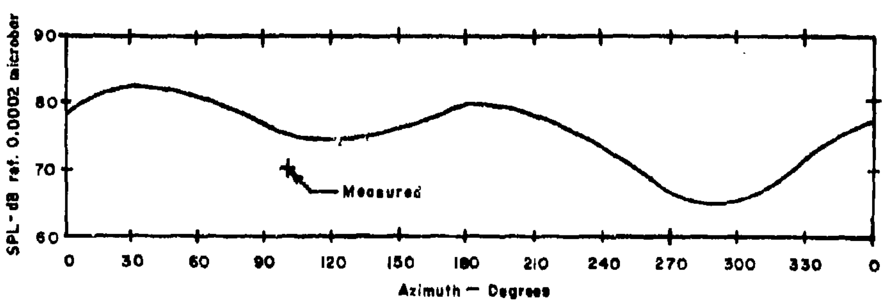
helicopter but will not be powerful enough to cause RIN to be heard inside the helicopter.

It was postulated in Section 2.3 that advancing blade RIN was primarily an acoustic effect of high tip Mach numbers rather than a result of high harmonic airloading. This can be seen by reference to Figure 43. The airloading variation with azimuth for the RIN and no-RIN cases is somewhat the same, except that the region of negative lift is of larger duration for the RIN case. However, there are no rapid changes in loading to cause increased high-frequency airloading harmonics. This can be seen more clearly in Figure 44, where the airloading harmonics have been plotted for the two cases. There is virtually no difference in the high-frequency airloads, and in fact, the amplitude decay with increasing harmonic frequency approaches λ^{-2} in both cases. Obviously, there are some differences in the harmonic content between the two cases, and this will cause differences in the character of the observed sound.

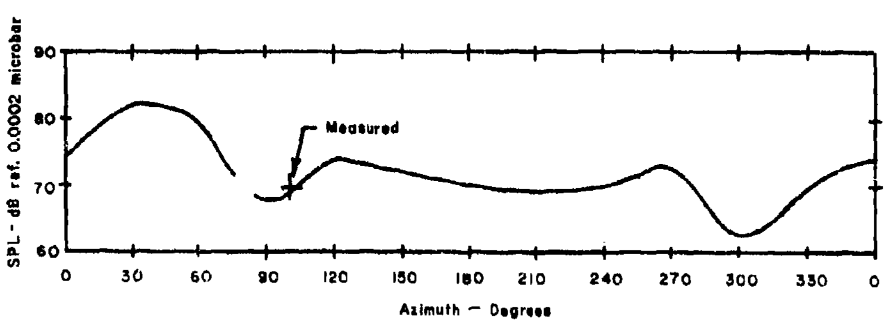
Based on the results of the measured airloading, and on the observed directionality of the radiated sound, it appears that for the CH-53A, advancing blade RIN is indeed a high tip Mach number acoustic effect rather than a result of increased-amplitude high-frequency airloads, as in the case of blade/wake interaction RIN. The observed directionality of the impulse confirms the theoretical explanation offered in Section 2.3. Compressibility effects, while enhancing the radiated slap, do not appear to be the primary cause of advancing blade slap. Compressibility generated noise is not highly directional, as shown in Section 2.3; however, the observed impulse is very directional in the plane of rotation. Since the advancing tip Mach number of 0.875 during 170-knot cruise is only slightly into drag divergence (Figure 8), the profile drag forces will not be predominant, and noise generated in this way will be a secondary, although possibly a significant, source.



a. Fundamental

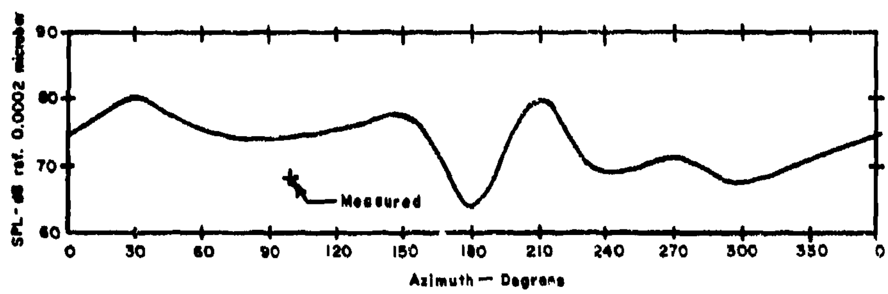


b. Second Harmonic

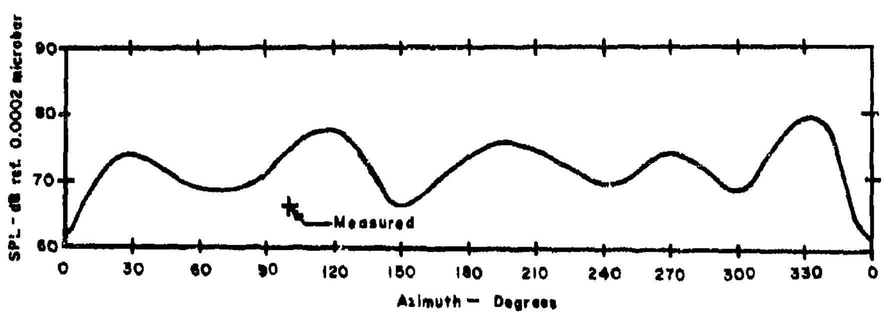


c. Third Harmonic

Figure 17. Calculated Hover Noise Variation,
Helicopter Heading 030 Degrees, No RIN.

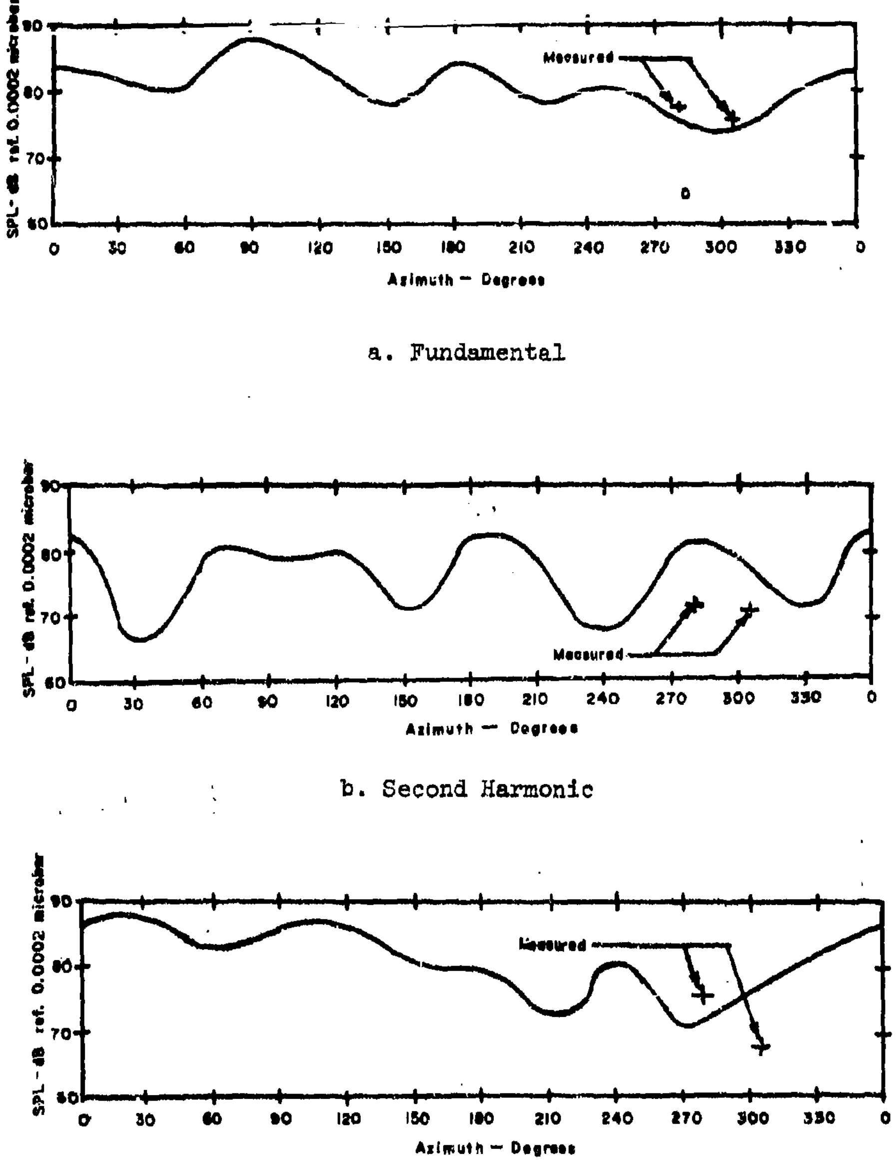


d. Fourth Harmonic



e. Fifth Harmonic

Figure 17. Concluded.

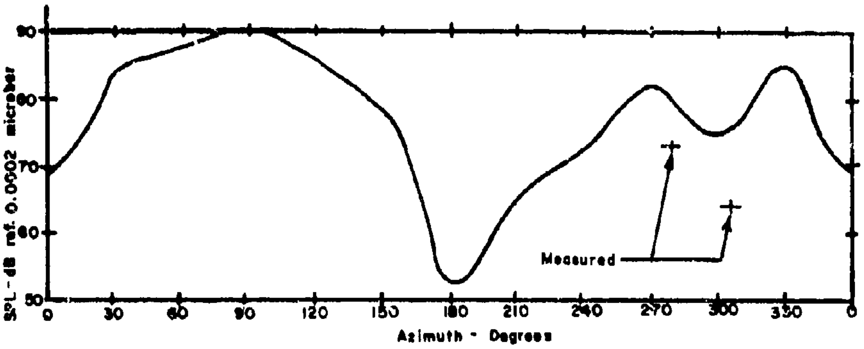


a. Fundamental

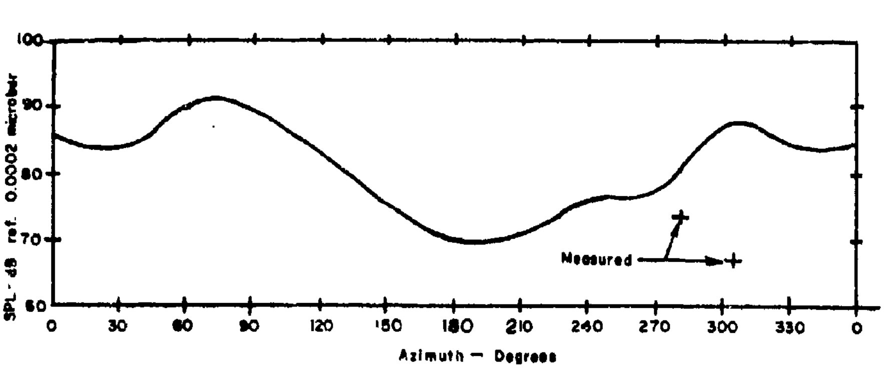
b. Second Harmonic

c. Third Harmonic

Figure 18. Calculated Hover-Noise Variation, Helicopter Heading 210 Degrees, Moderate RIN.

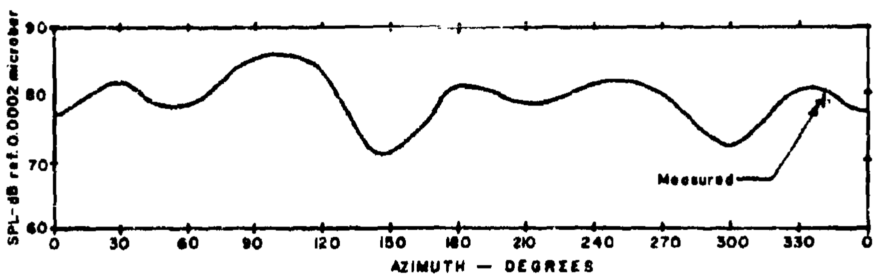


d. Fourth Harmonic

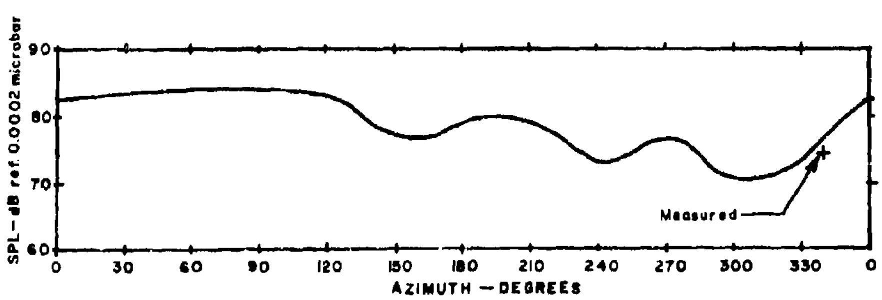


e. Fifth Harmonic

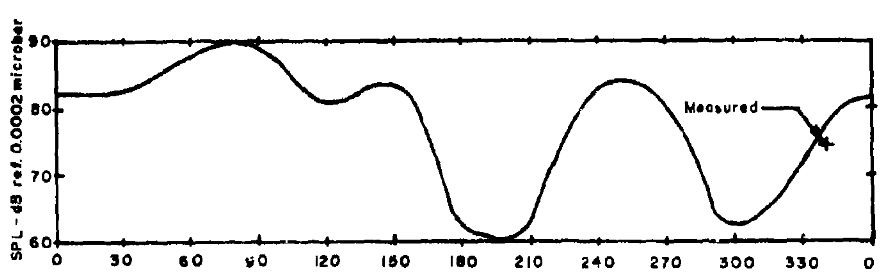
Figure 18. Concluded.



a. Fundamental

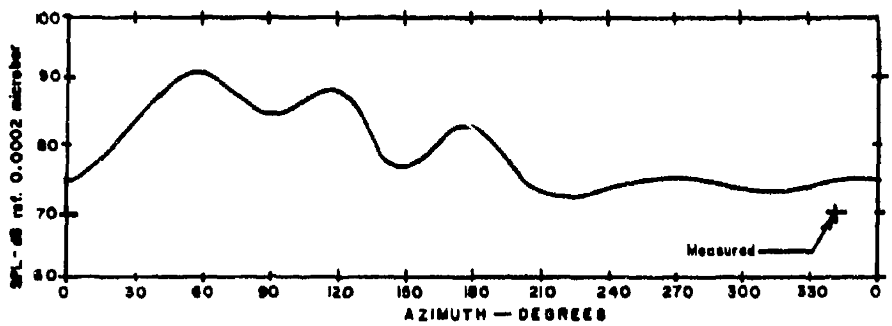


b. Second Harmonic

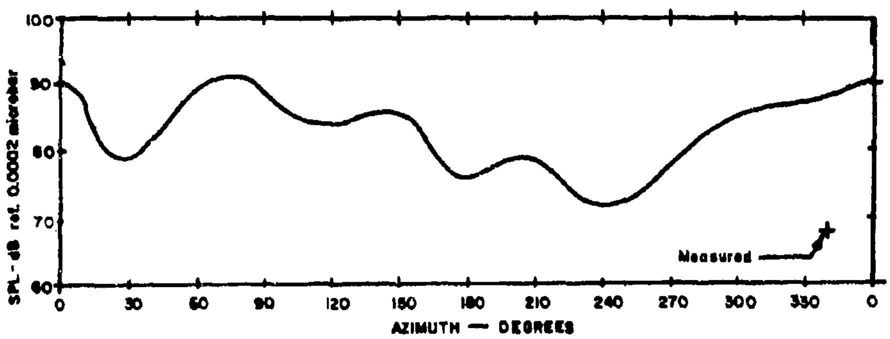


c. Third Harmonic

Figure 19. Calculated Hover Noise Variation, Helicopter Heading 270 Degrees, Proncunced RIN.

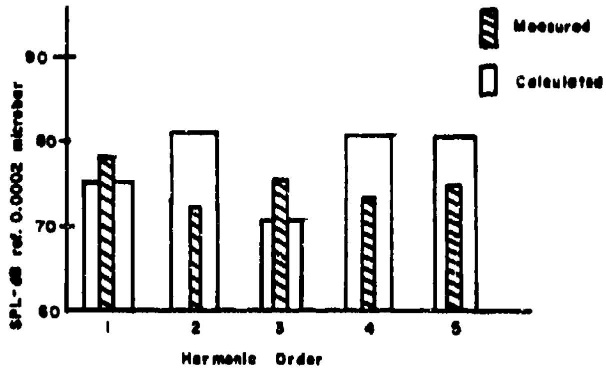


d. Fourth Harmonic

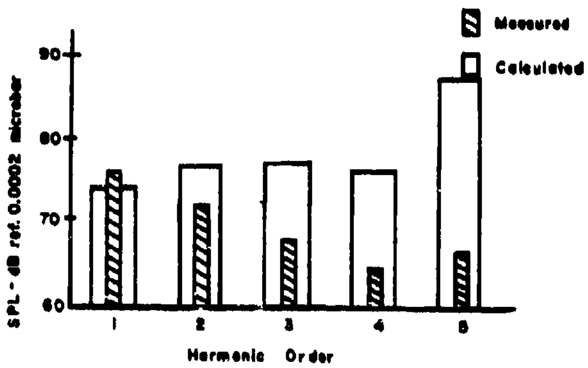


e. Fifth Harmonic

Figure 19. Concluded.



a. Azimuth Location 280 Degrees



b. Azimuth Location 306 Degrees

Figure 20. Measured and Calculated Rotational Noise Spectra at Two Locations During Hover, Helicopter Heading 210 Degrees.

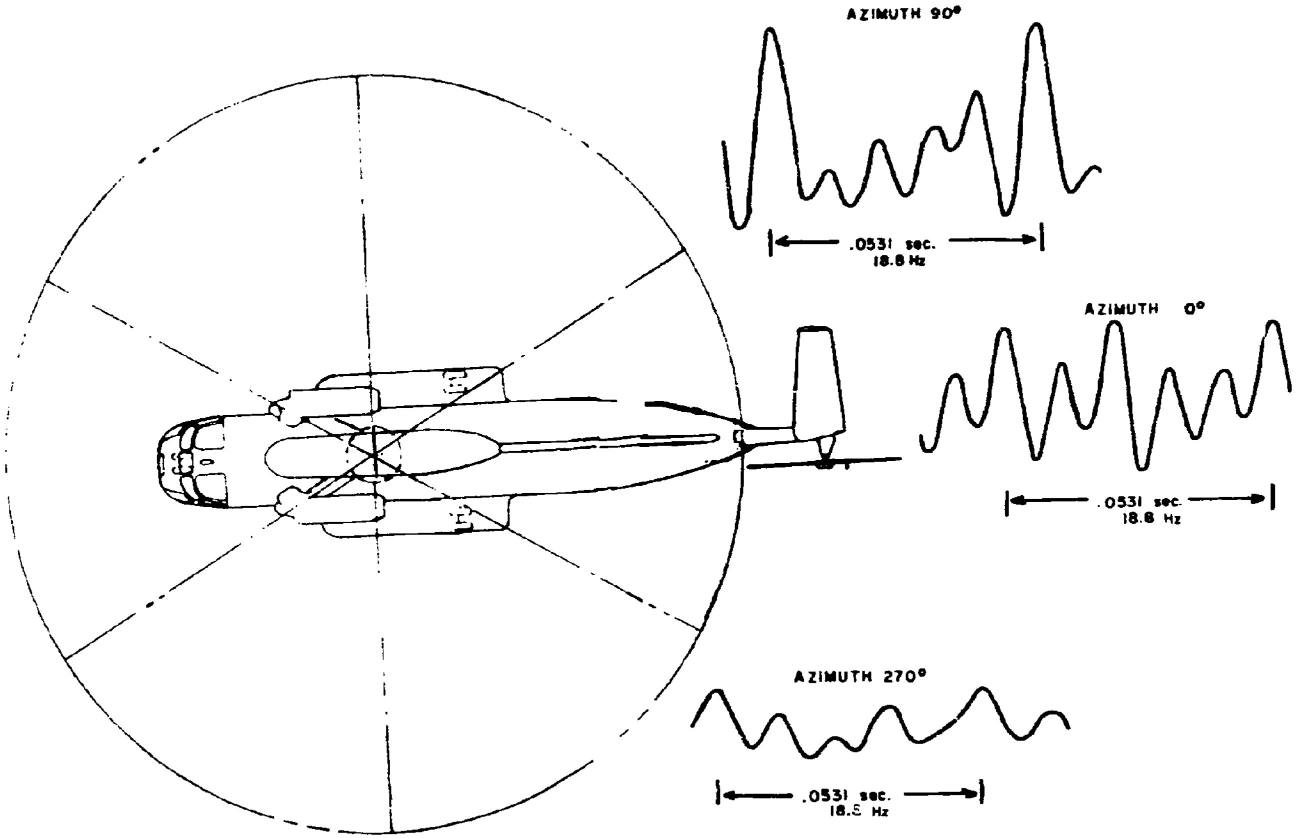
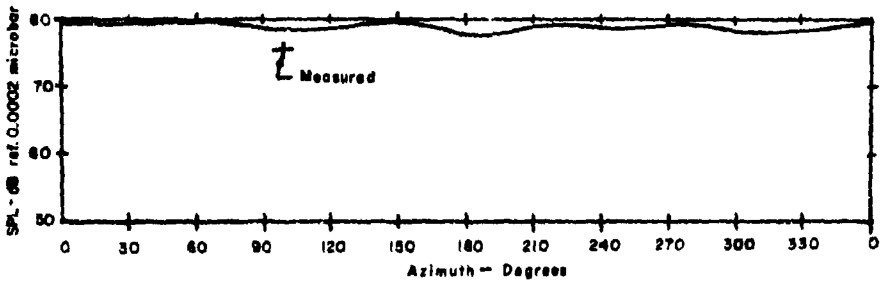
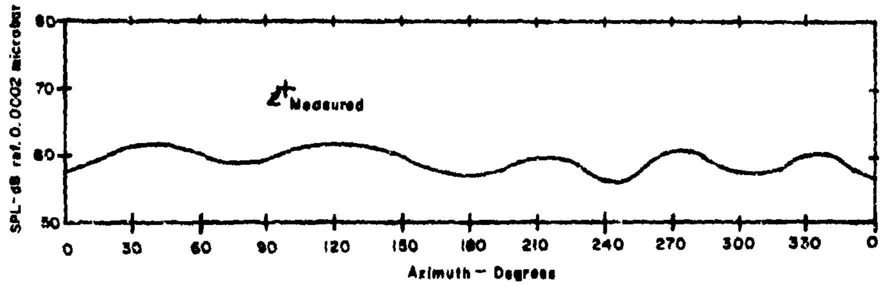


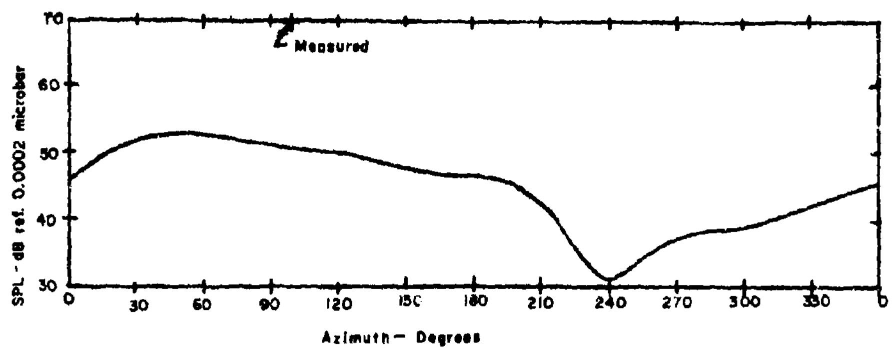
Figure 21. Calculated Time Histories of Acoustic Pressure at Several Azimuth Locations During Hover, Helicopter Heading 270 Degrees Magnetic, RIN Condition.



a. Fundamental

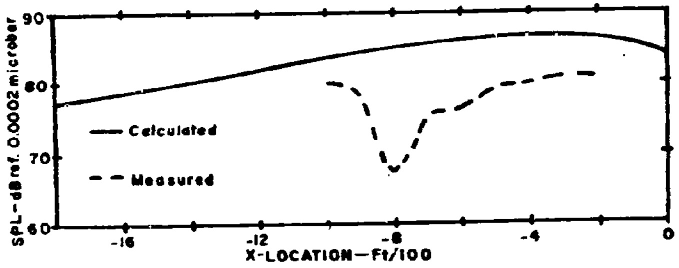


b. Second Harmonic

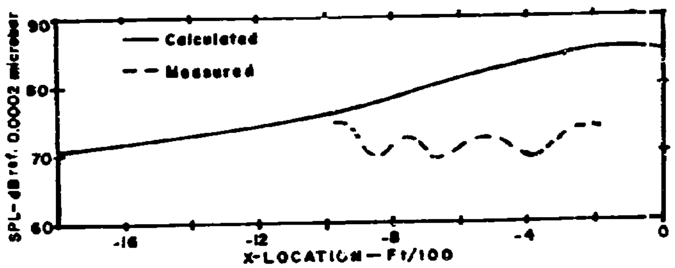


c. Third Harmonic

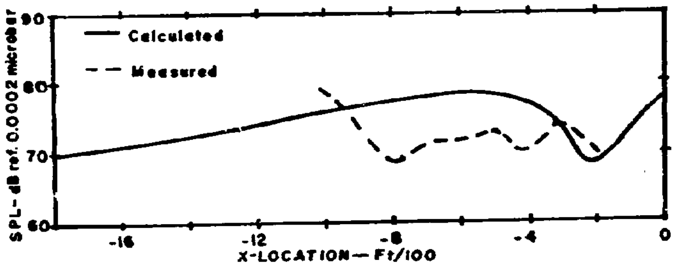
Figure 22. Calculated Rotor Noise Variation Using Theoretical Airloads.



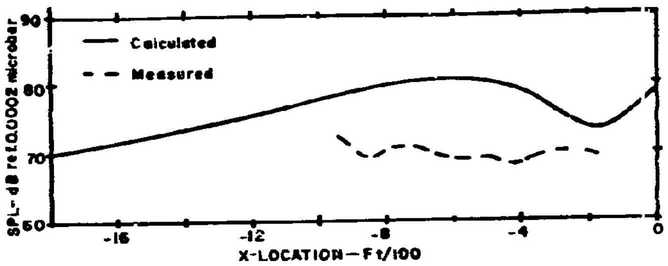
a. First Harmonic, Starboard Side



b. First Harmonic, Port Side

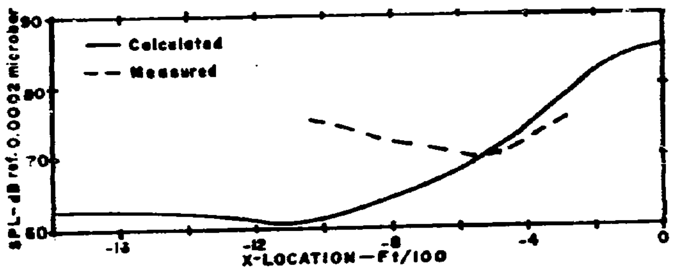


c. Second Harmonic, Starboard Side

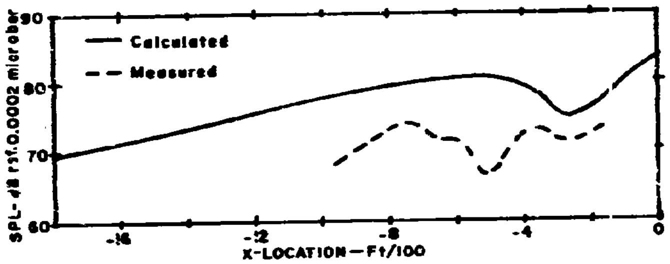


d. Second Harmonic, Port Side

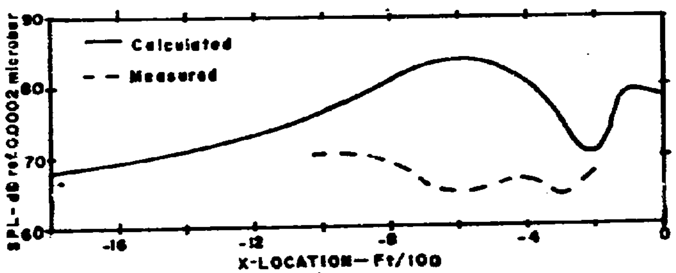
Figure 23. Rotational Noise Harmonic SPL-vs-Distance, Measured Airloads, 120 kt.



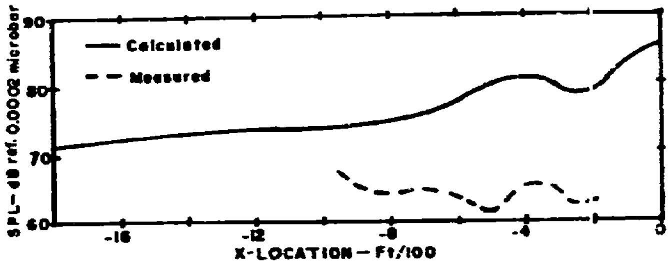
e. Third Harmonic, Starboard Side



f. Third Harmonic, Port Side

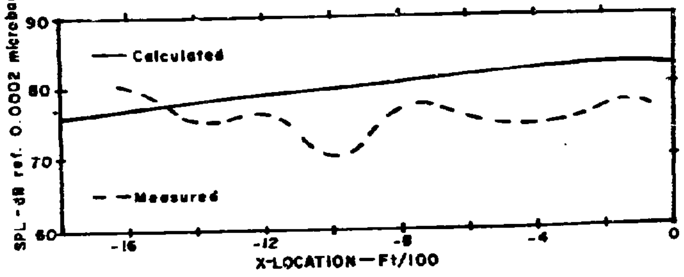


g. Fourth Harmonic, Starboard Side

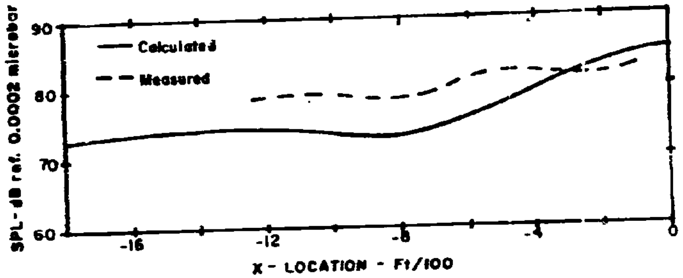


h. Fourth Harmonic, Port Side

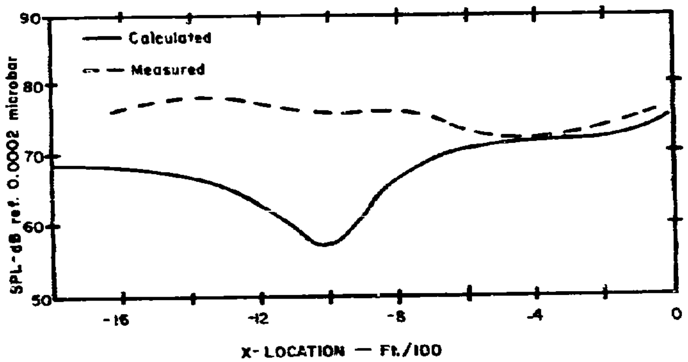
Figure 23. Concluded.



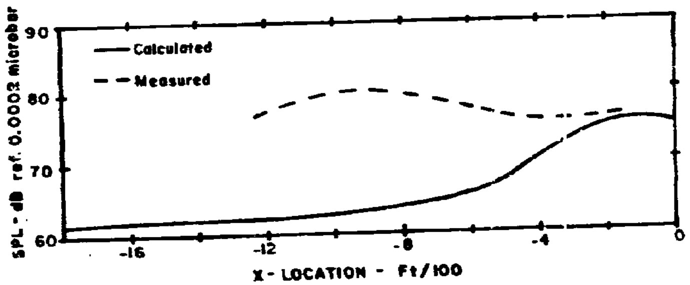
a. First Harmonic, Starboard Side



b. First Harmonic, Port Side

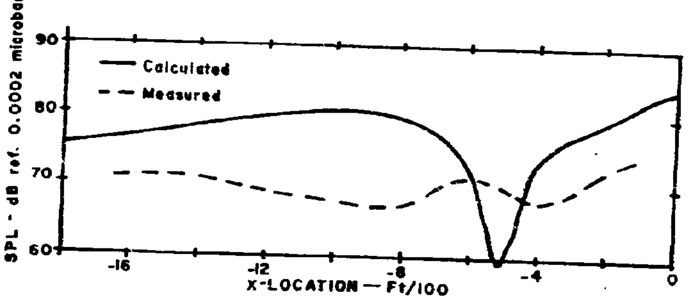


c. Second Harmonic, Starboard Side

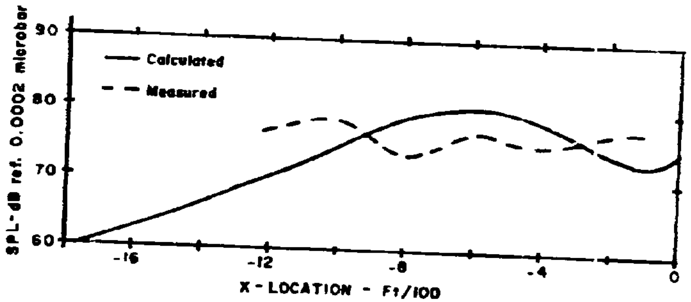


d. Second Harmonic, Port Side

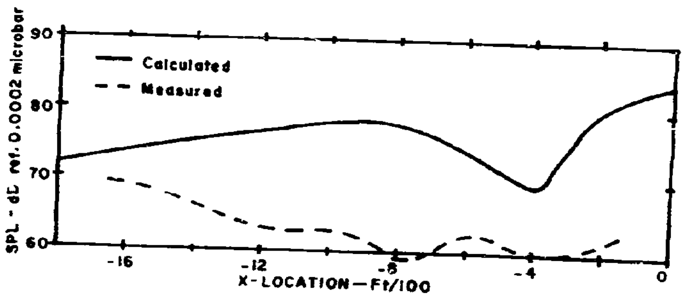
Figure 24. Rotational Noise Harmonic SPL-vs-Distance, Measured Airloads, 140 kt.



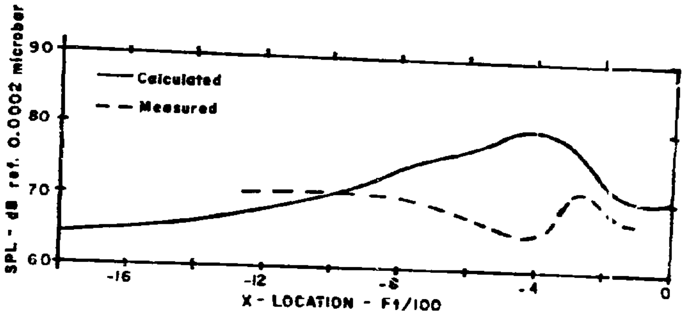
e. Third Harmonic, Starboard Side



f. Third Harmonic, Port Side

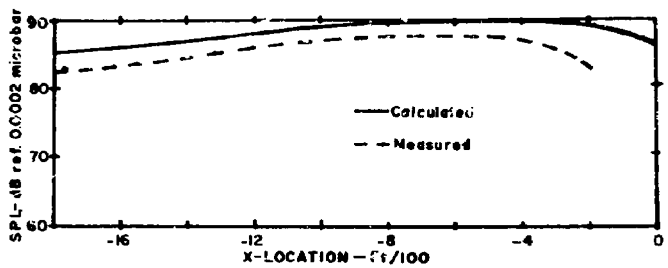


g. Fourth Harmonic, Starboard Side

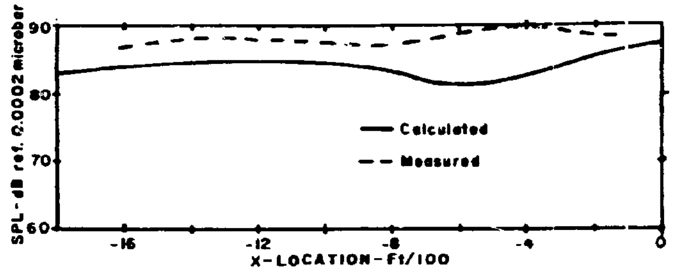


h. Fourth Harmonic, Port Side

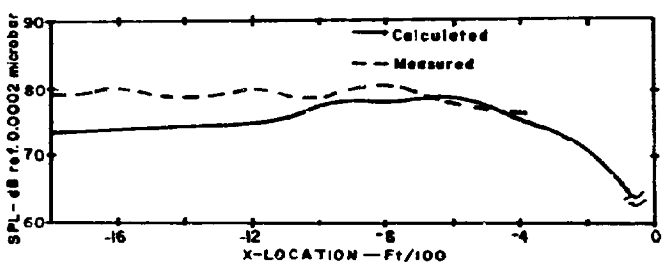
Figure 24. Concluded.



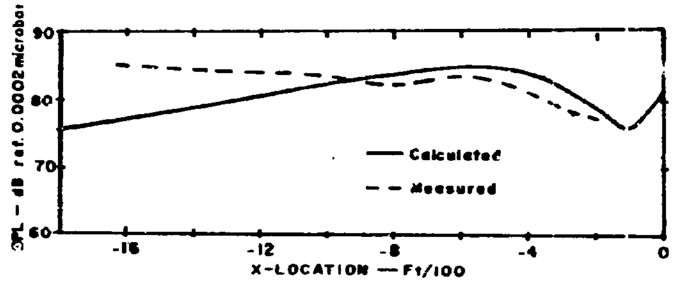
a. First Harmonic, Starboard Side



b. First Harmonic, Port Side

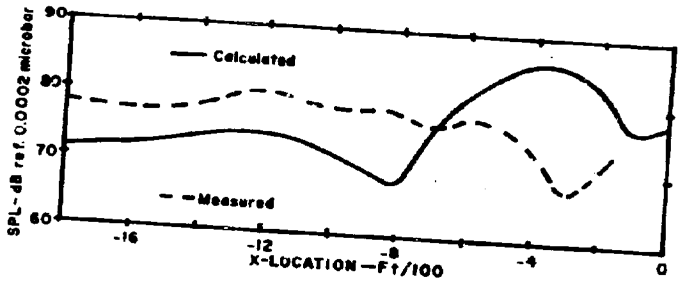


c. Second Harmonic, Starboard Side

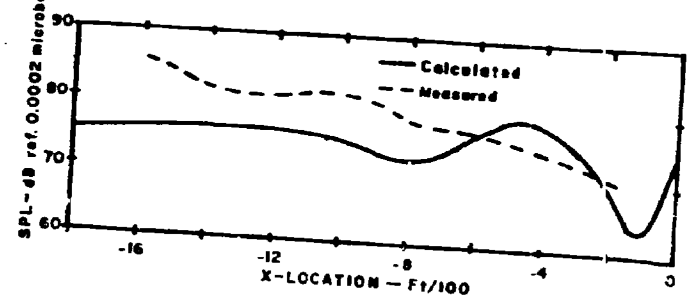


d. Second Harmonic, Port Side

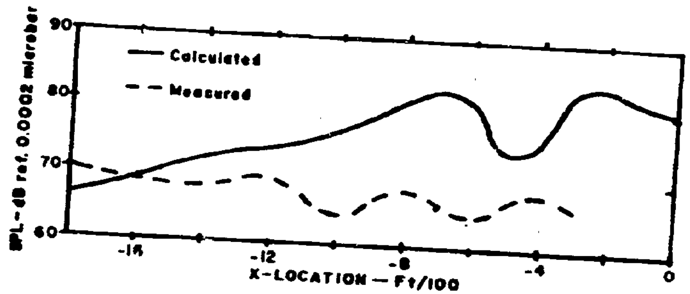
Figure 25. Rotational Noise Harmonic SPL-vs-Distance, Measured Airloads, 170 kt.



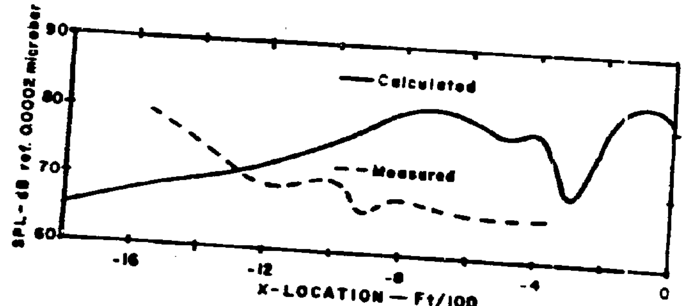
e. Third Harmonic, Starboard Side



f. Third Harmonic, Port Side

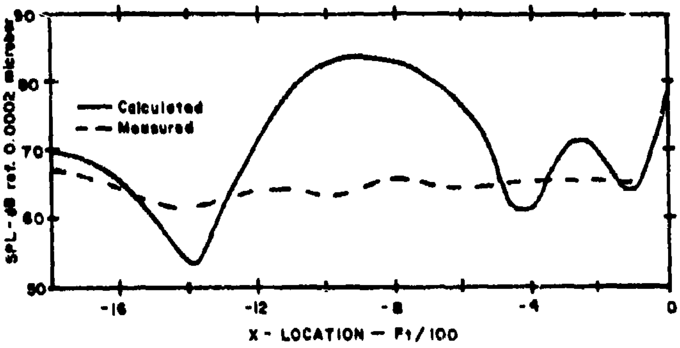


g. Fourth Harmonic, Starboard Side

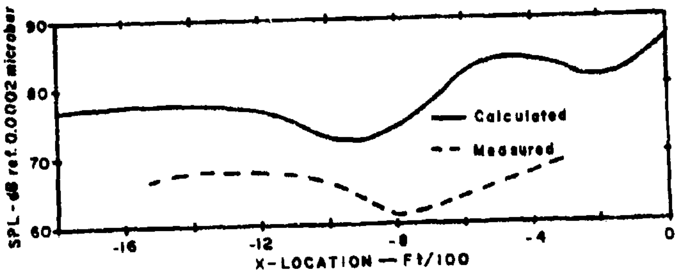


h. Fourth Harmonic, Port Side

Figure 25. Continued.

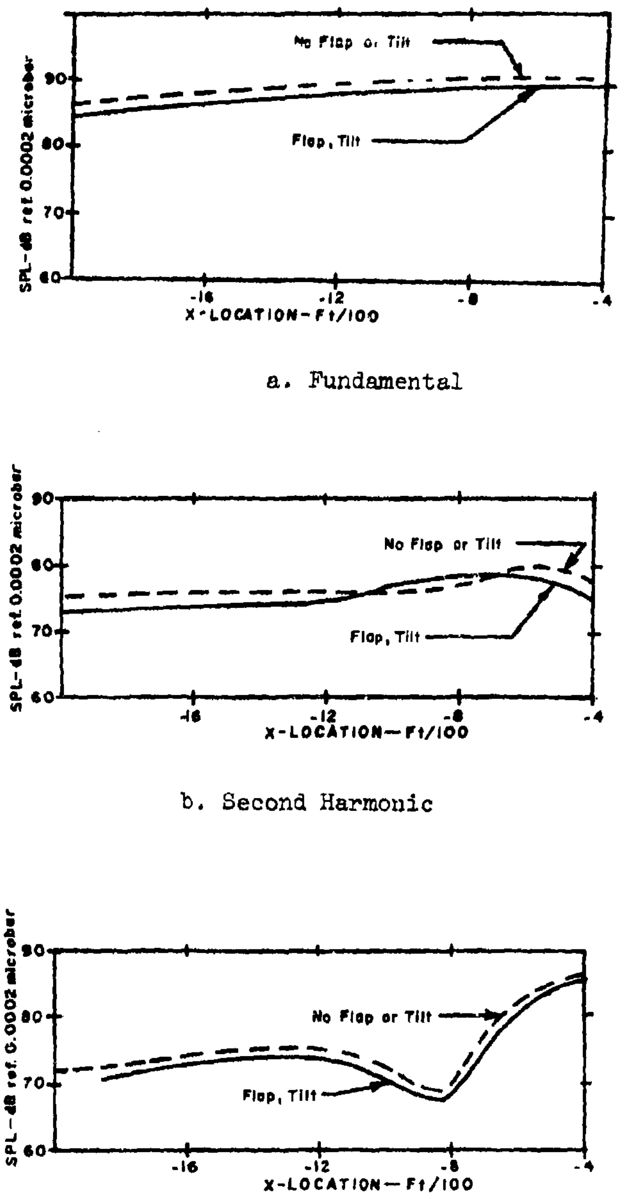


i. Fifth Harmonic, Starboard Side



j. Fifth Harmonic, Port Side

Figure 25. Concluded.

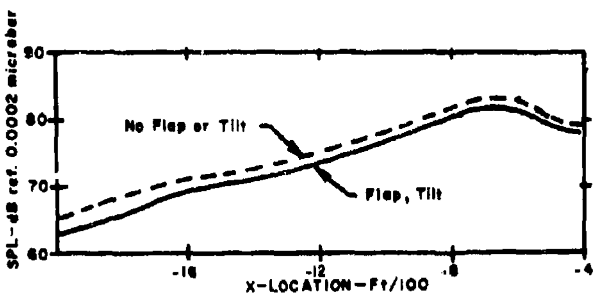


a. Fundamental

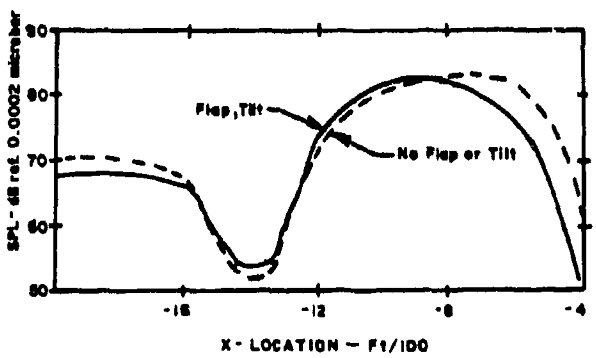
b. Second Harmonic

c. Third Harmonic

Figure 26. Effect of Shaft Inclination and Blade Flapping on Calculated Noise, Measured Airloads, 170 kt, Starboard Side.



d. Fourth Harmonic



e. Fifth Harmonic

Figure 26. Concluded.

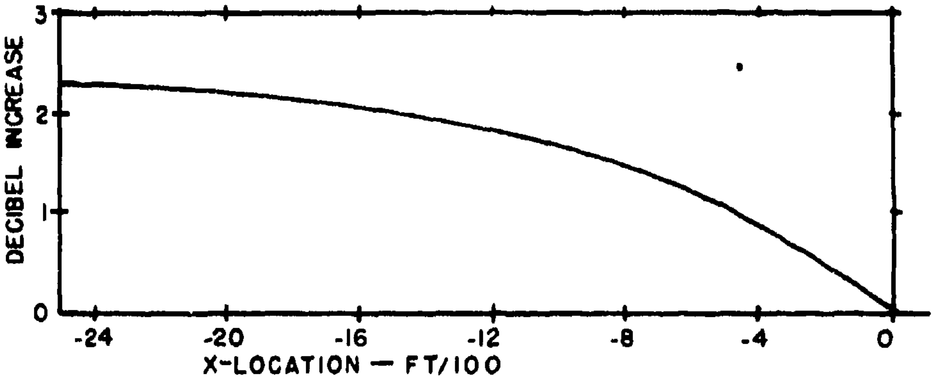


Figure 27. Effect of Simulated Translational Mach Number on Calculated Noise, 170 kt, Centerline.

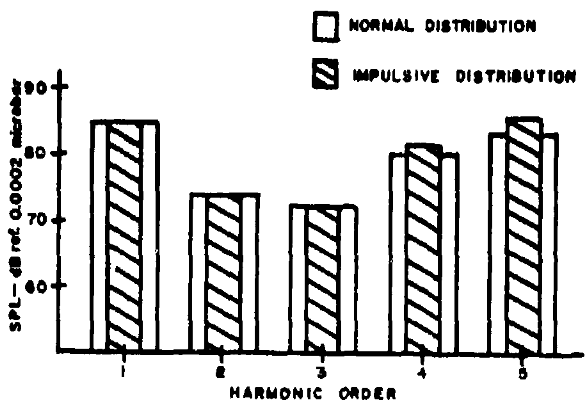
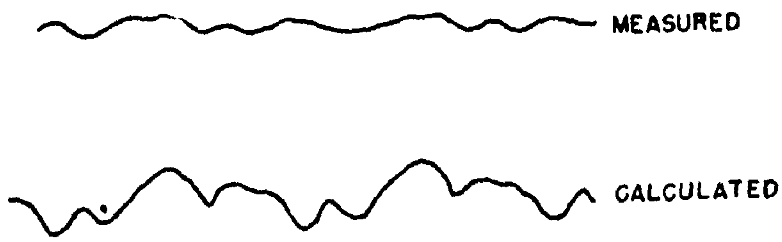
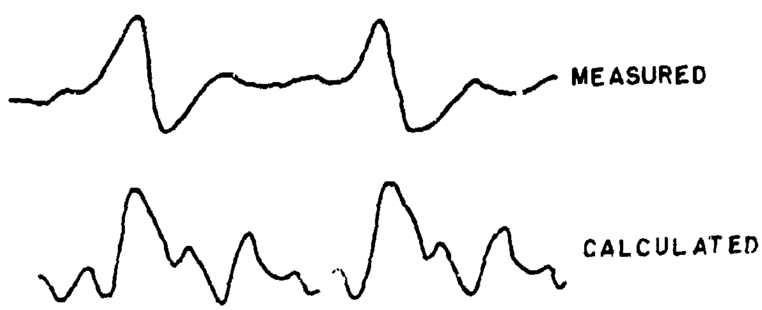


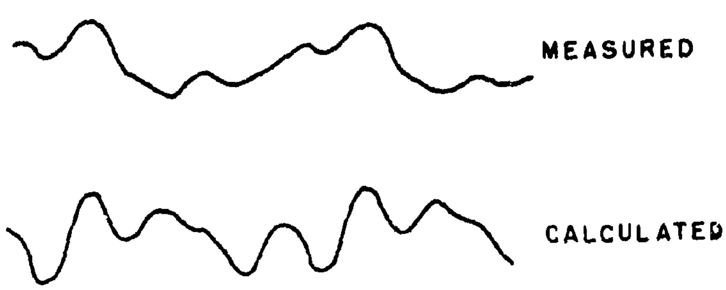
Figure 28. Effect of Simulated Impulsive Chordwise Loading Distribution.



a. 170 kt, No RIN, Helicopter Over 2500 ft Away

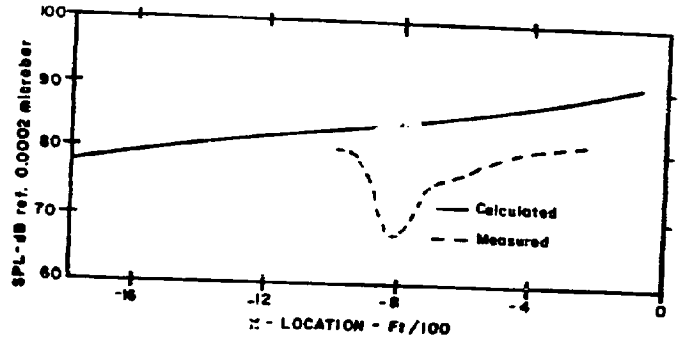


b. 170 kt, Maximum RIN, Helicopter 500 to 1000 ft Away

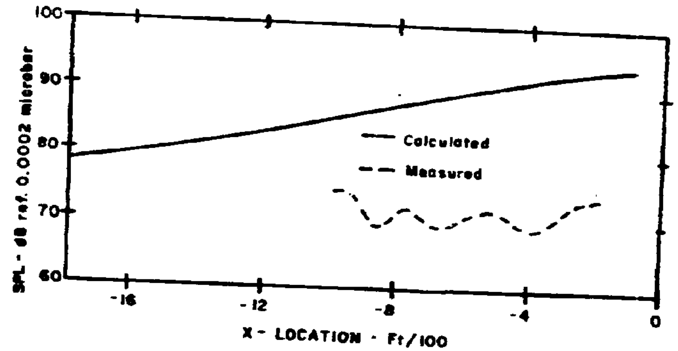


c. 140 kt, No RIN, Helicopter Approximately 500 ft Away

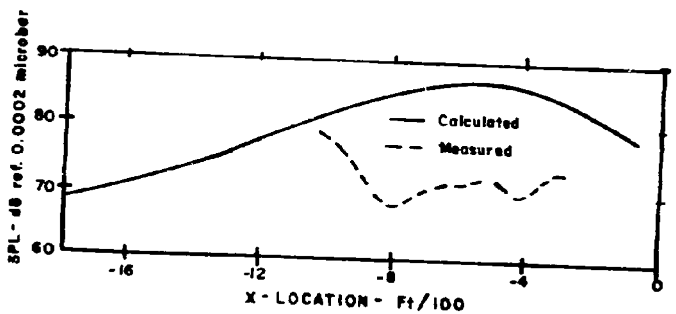
Figure 29. Measured and Calculated Time Histories of Acoustic Pressure on Starboard Side.



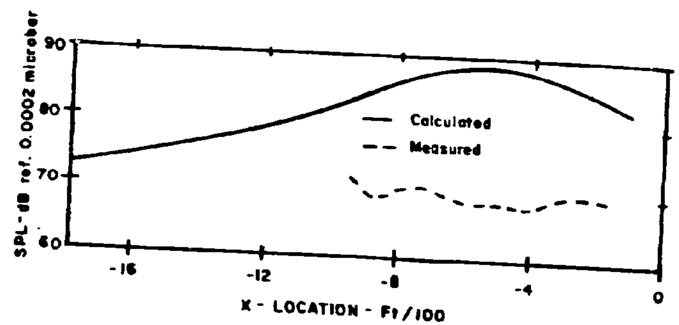
a. First Harmonic, Starboard Side



b. First Harmonic, Port Side

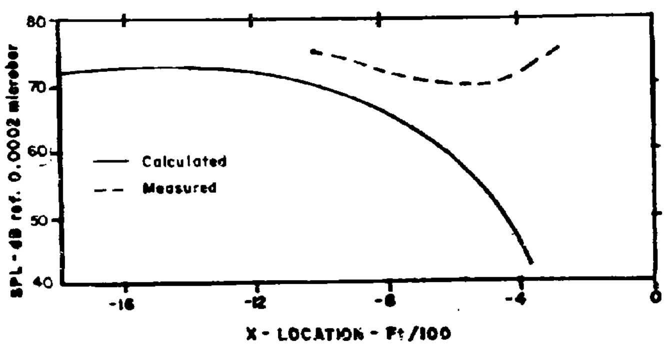


c. Second Harmonic, Starboard Side

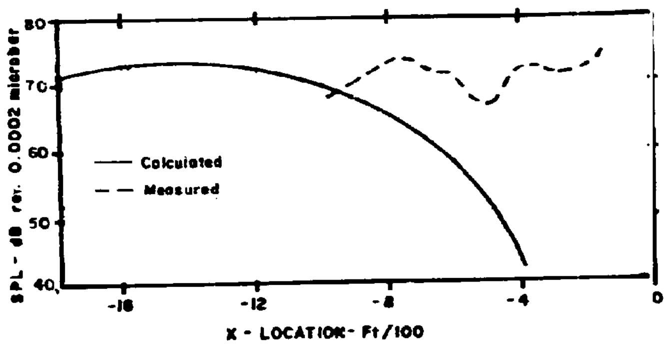


d. Second Harmonic, Port Side

Figure 30. Rotational Noise Harmonic SPL-vs-Distance, Theoretical Airloads, 120 kt.

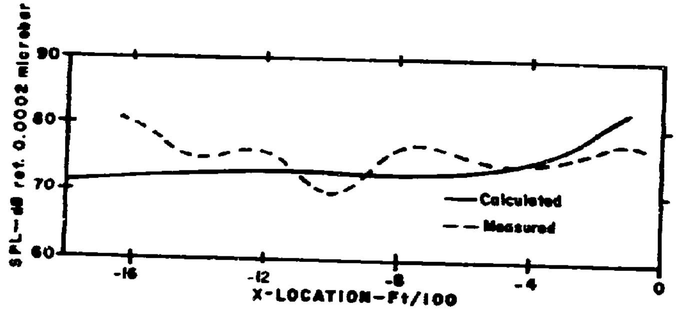


e. Third Harmonic, Starboard Side

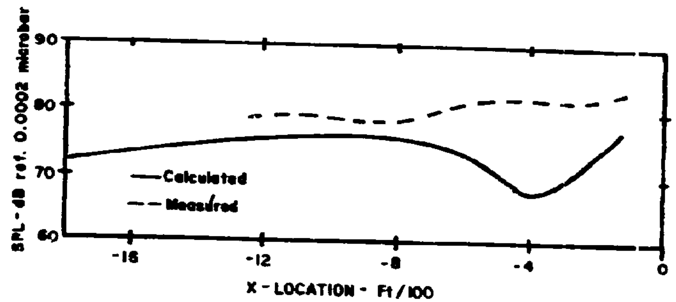


f. Third Harmonic, Port Side

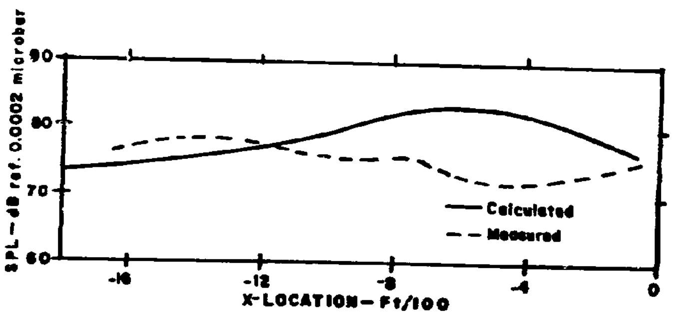
Figure 30. Concluded.



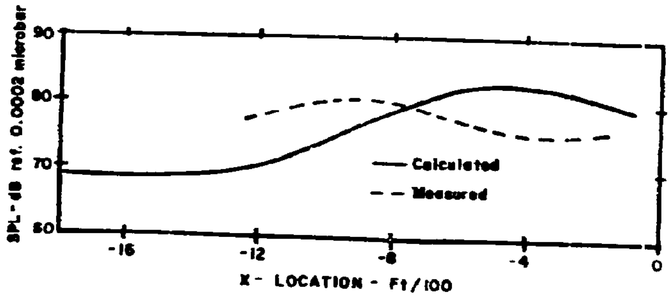
a. First Harmonic, Starboard Side



b. First Harmonic, Port Side

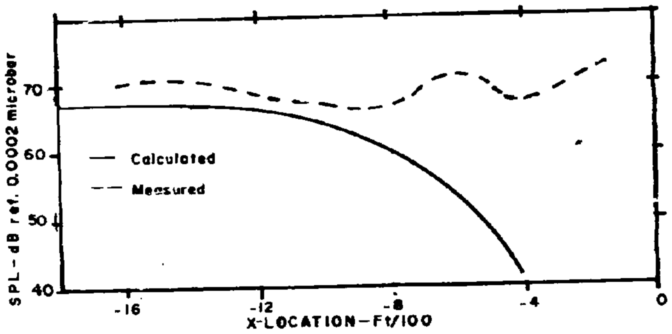


c. Second Harmonic, Starboard Side

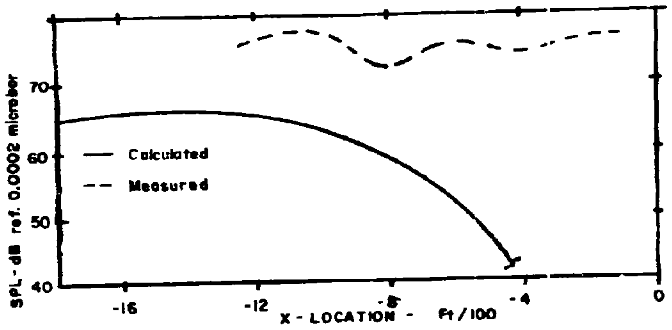


d. Second Harmonic, Port Side

Figure 31. Rotational Noise Harmonic SPL-vs-Distance, Theoretical Airloads, 140 kt.

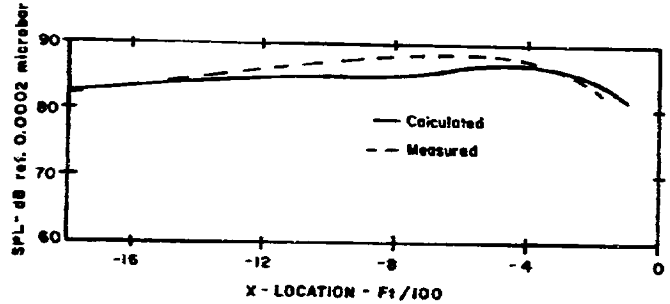


e. Third Harmonic, Starboard Side

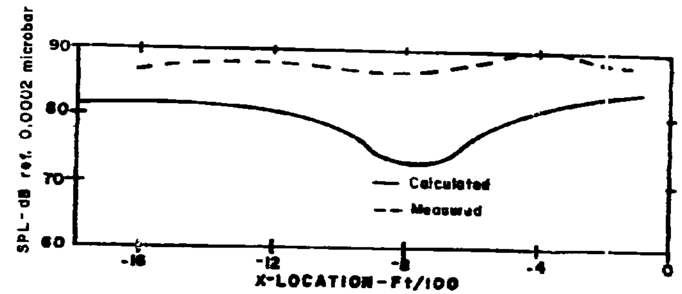


f. Third Harmonic, Port Side

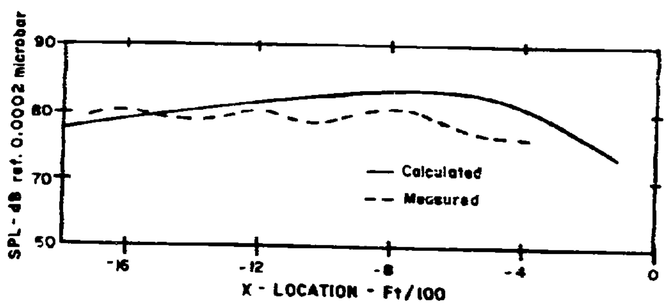
Figure 31. Concluded.



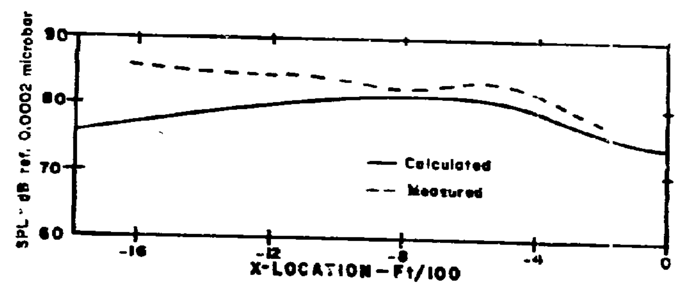
a. First Harmonic, Starboard Side



b. First Harmonic, Port Side

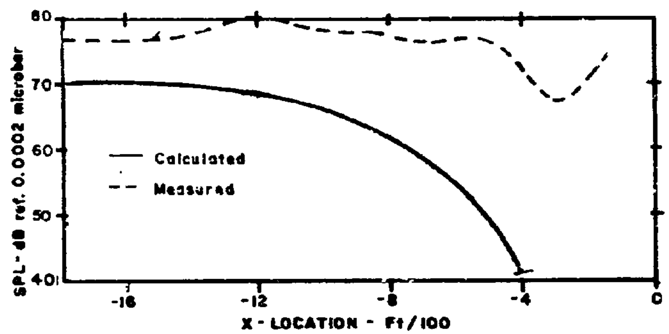


c. Second Harmonic, Starboard Side

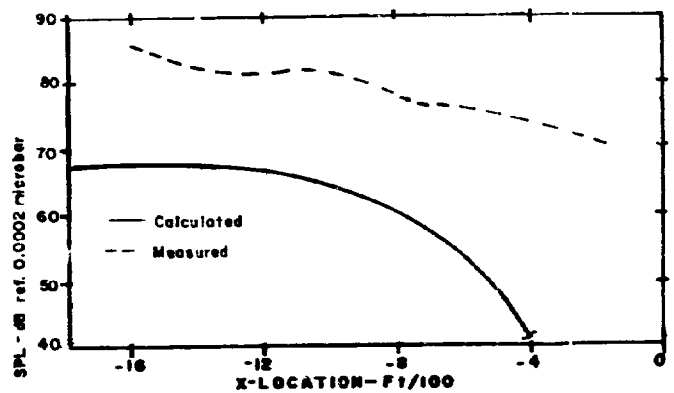


d. Second Harmonic, Port Side

Figure 32. Rotational Noise Harmonic SPL-vs-Distance, Theoretical Airloads, 170 kt.

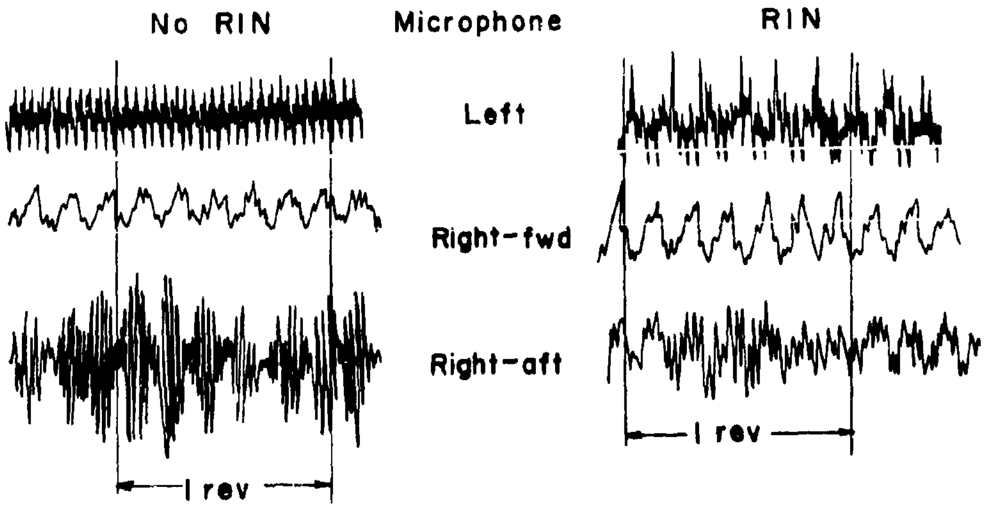


e. Third Harmonic, Starboard Side

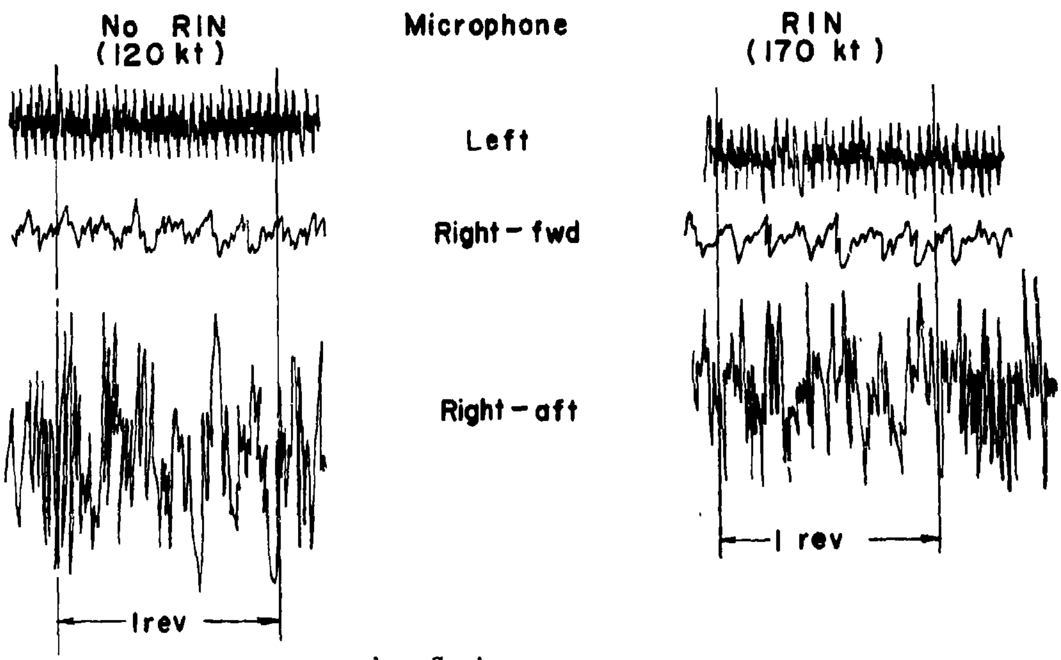


f. Third Harmonic, Port Side

Figure 32. Concluded.



a. Hover



b. Cruise

Figure 33. Sound Pressure Recorded by Internal Microphones.

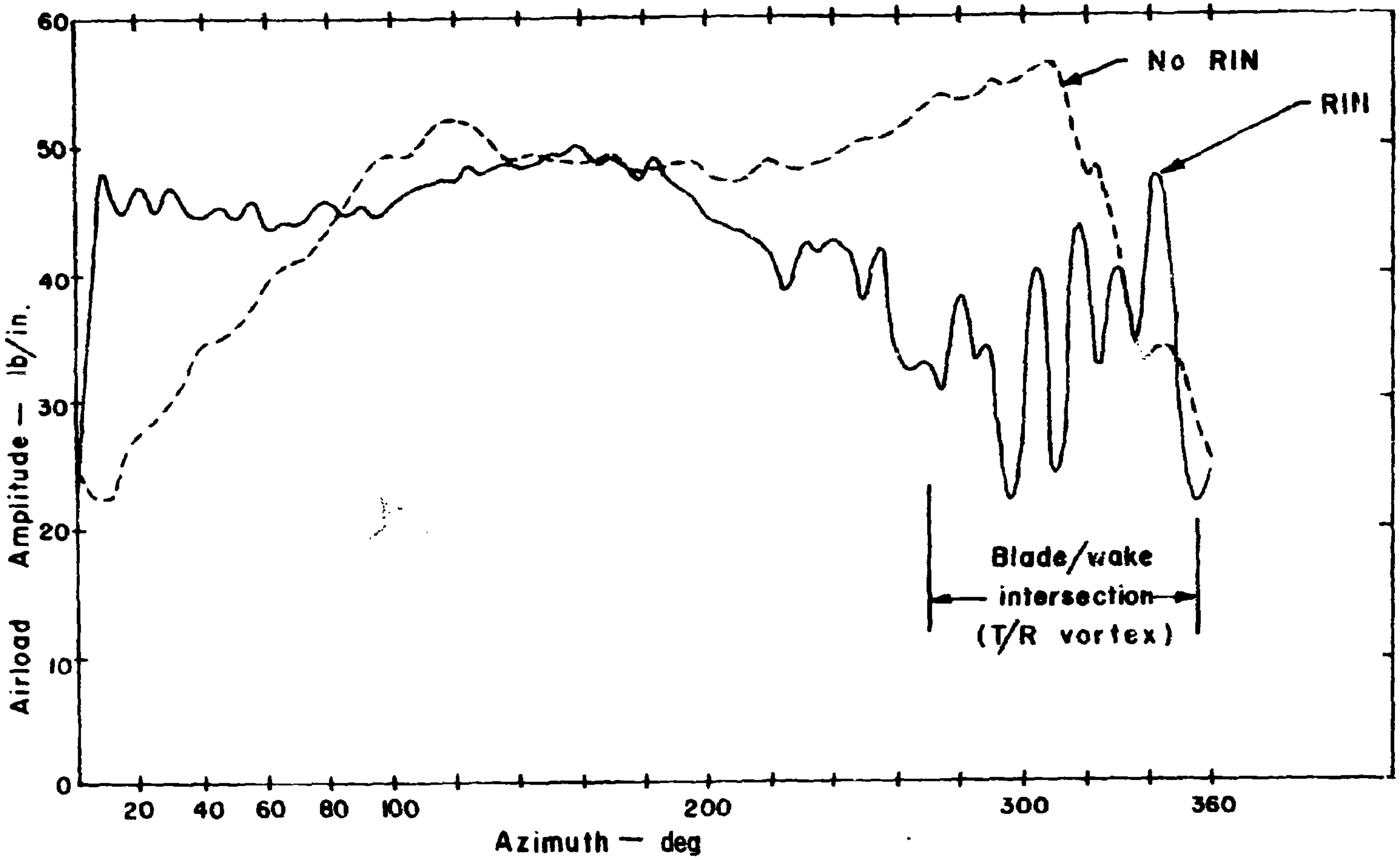
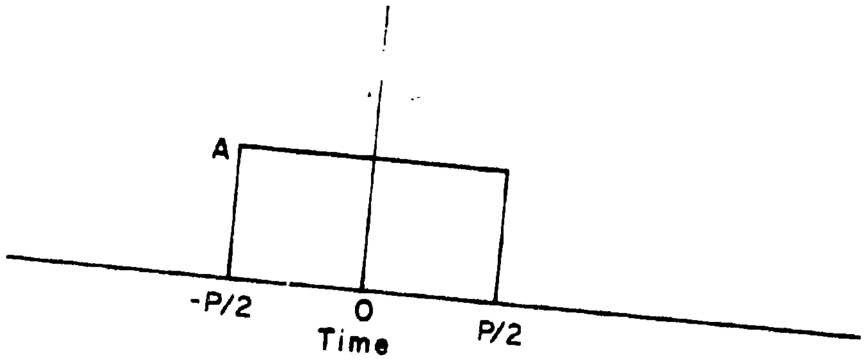


Figure 34. Blade Section Airloading as a Function of Azimuth for Hover RIN and No-RIN Conditions (98% Span).



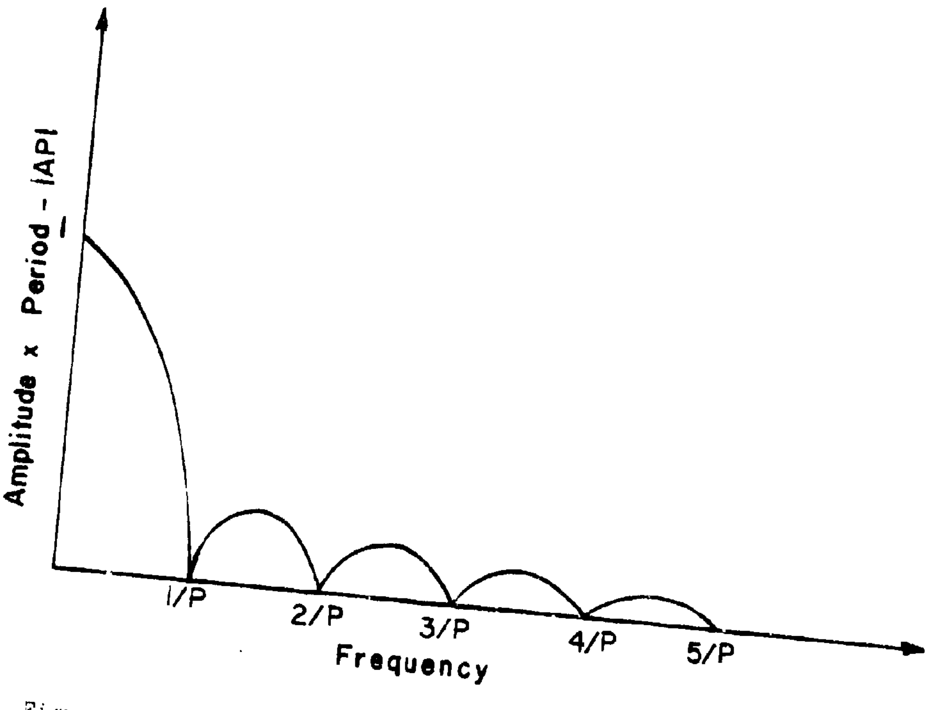


Figure 35. Harmonic Frequency Spectrum of a Rectangular Pulse.

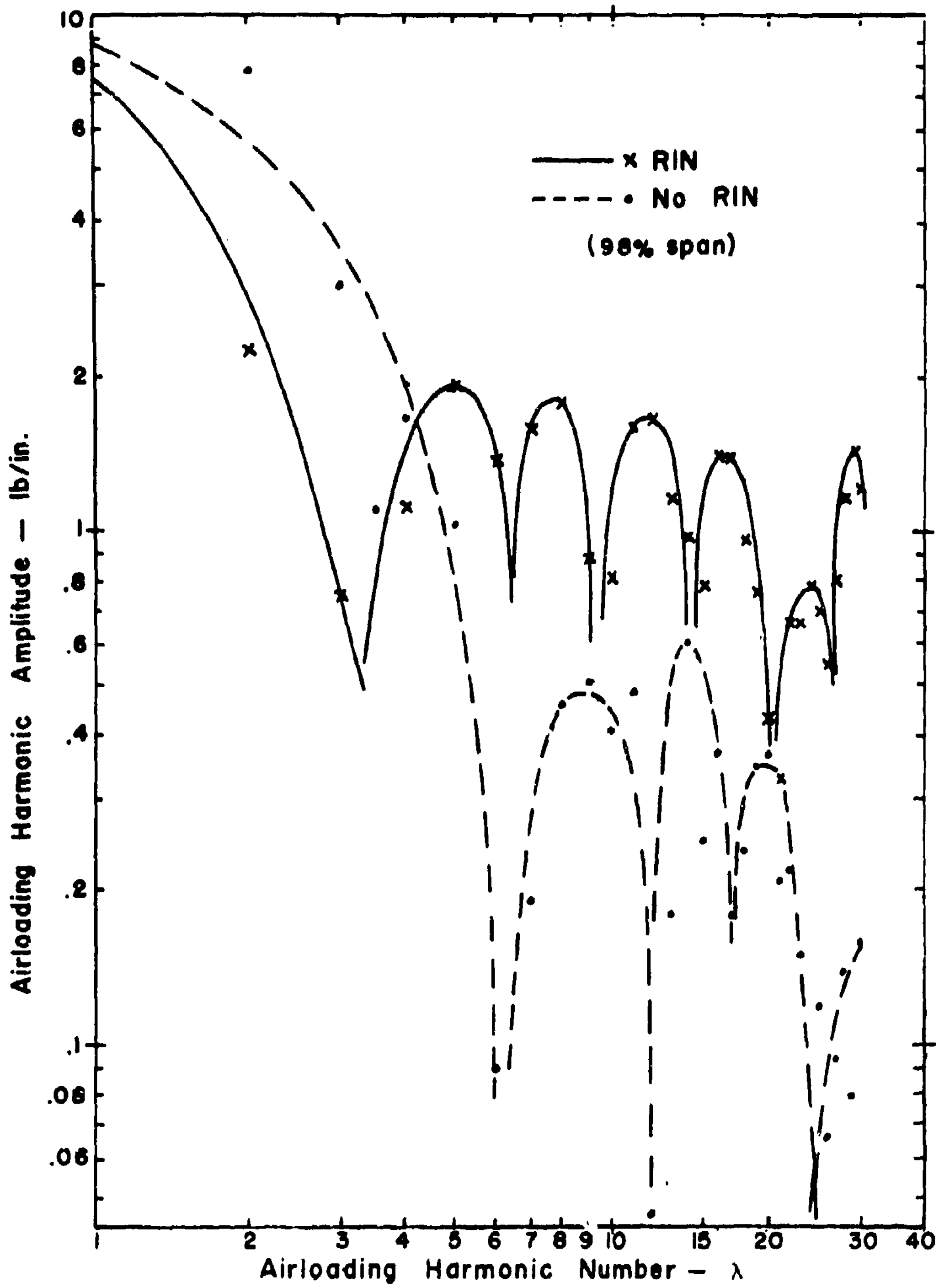


Figure 36. Airloading Harmonic Amplitude for Hover RIN and No-RIN Conditions.

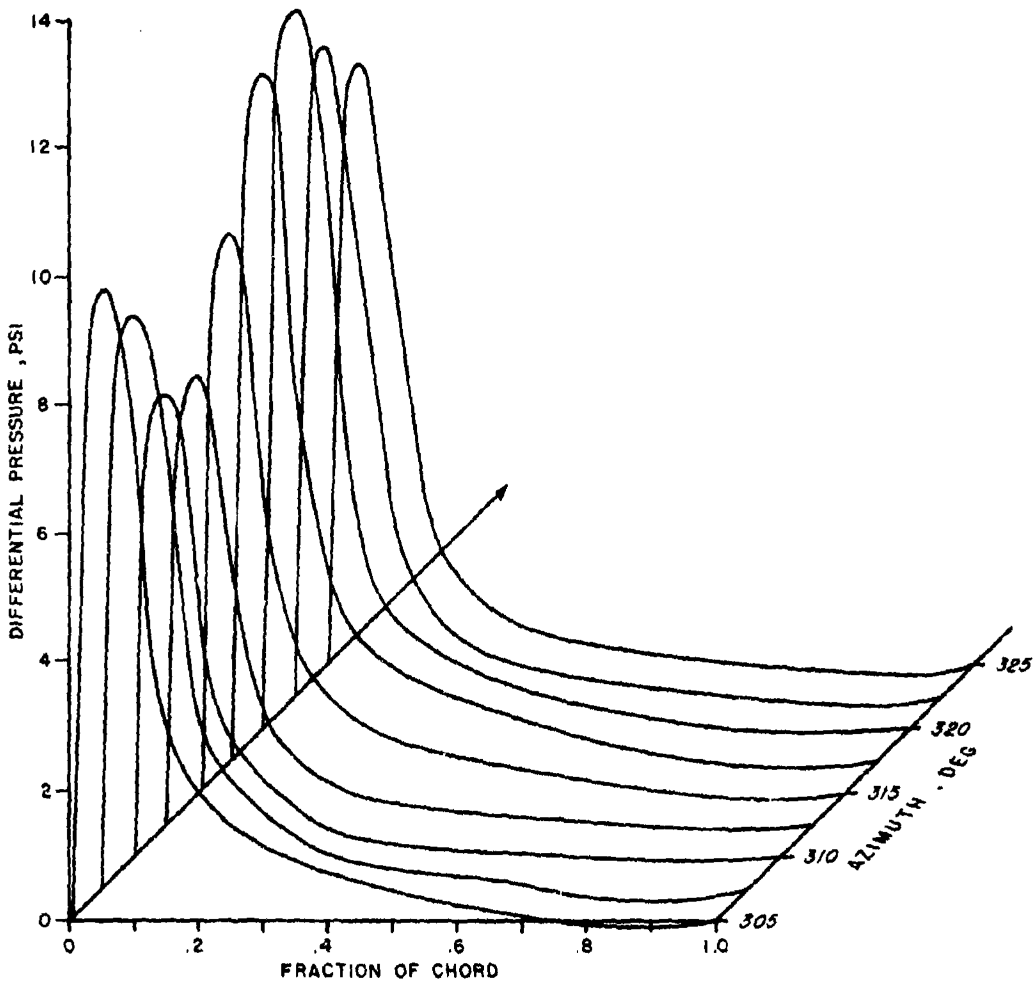
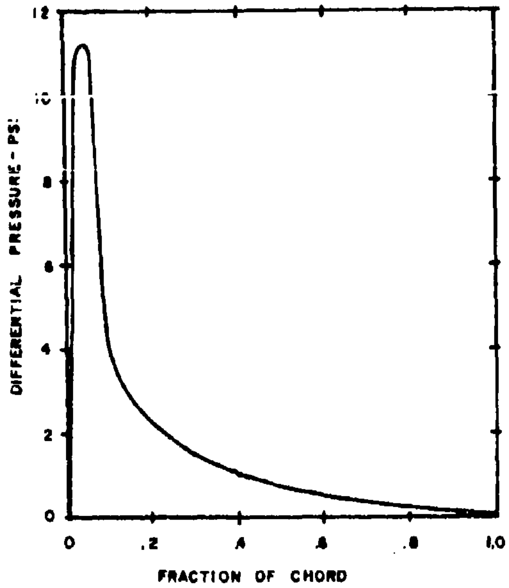
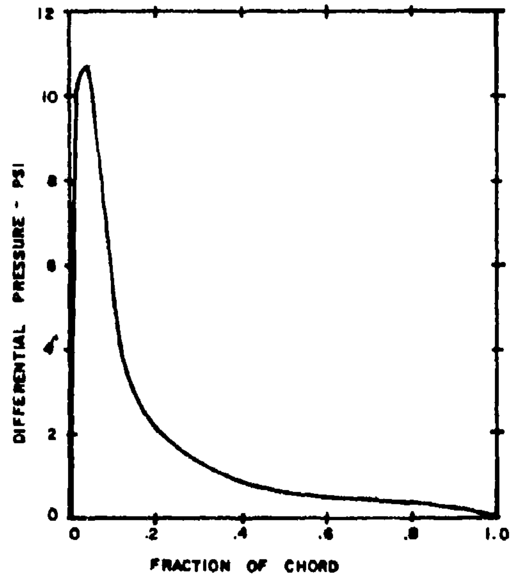


Figure 37. Chordwise Distribution of Differential Pressure as a Function of Azimuth, Hover RIN Condition.



a. RIN Present



b. RIN Not Present

Figure 38. Chordwise Pressure Distribution With and Without RIN, 98% Span, 160° Azimuth.

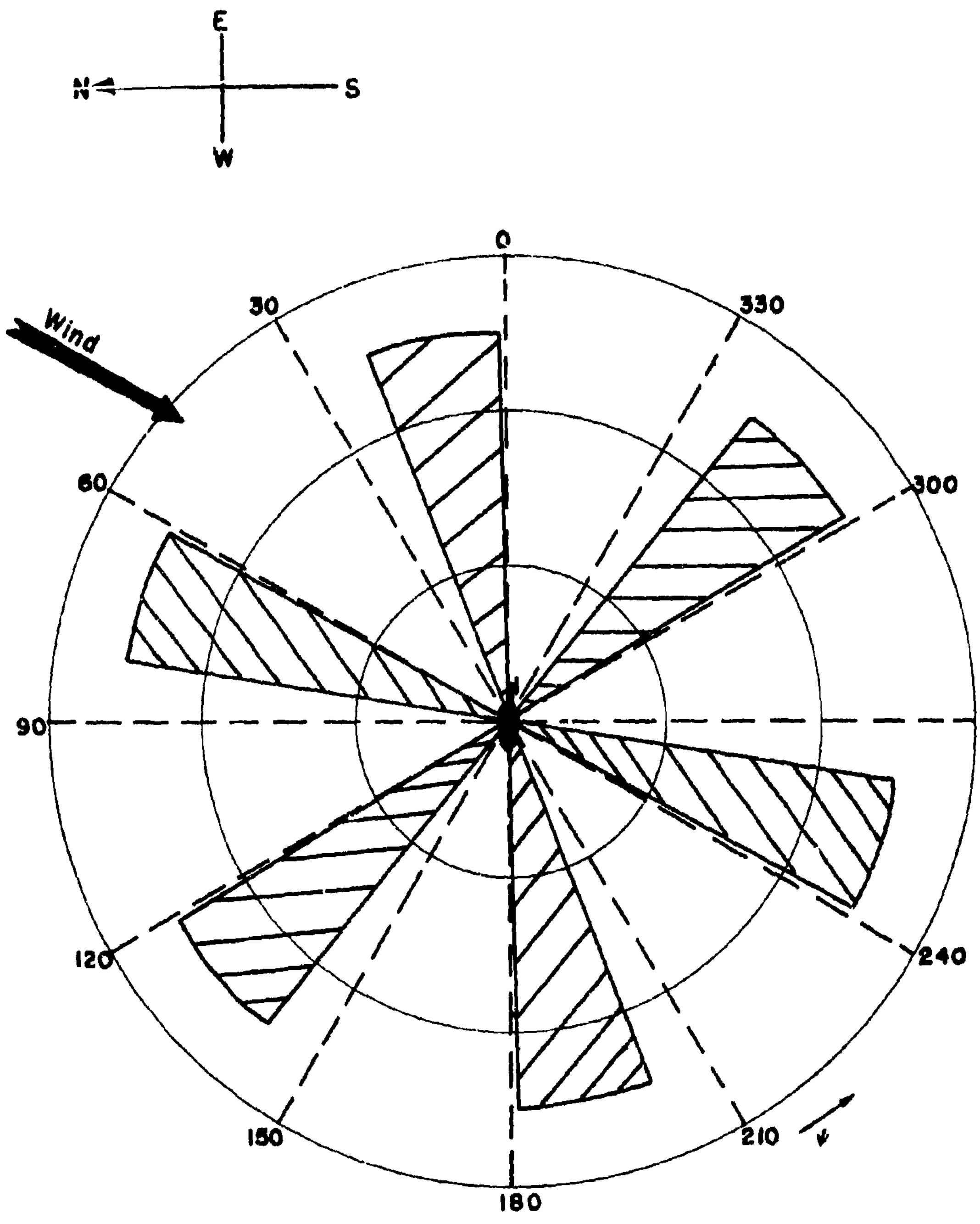


Figure 39. Range of Rotor Blade Locations at Instant of RIN Generation for OGE Hover.

a. Helicopter Over 2500 ft Away

b. Helicopter Approximately 1500 ft Away

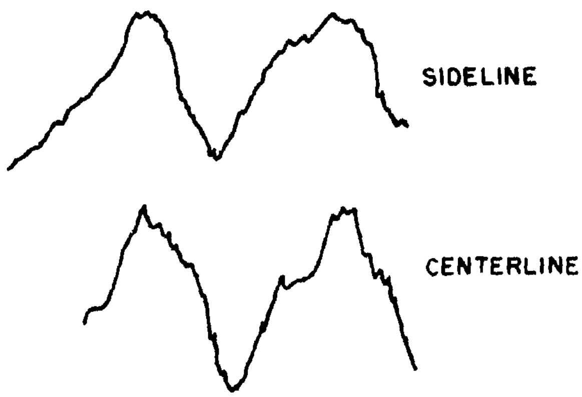
Figure 40. Measured Time History of Acoustic Pressure, Advancing Blade Side, 170 kt.

c. Helicopter Approximately 600 ft Away

d. Helicopter Passing Over Microphones

Figure 40. Concluded.

a. Maximum Sideline Impulse, Helicopter Approximately 600 ft Away



b. Helicopter Passing Over Microphones

Figure 41. Measured Time History of Acoustic Pressure, Retreating Blade Side, 170 kt.

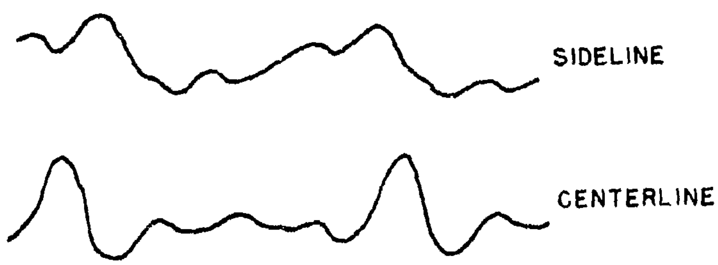


Figure 42. Measured Time History of Acoustic Pressure, Advancing Blade Side, 140 kt.

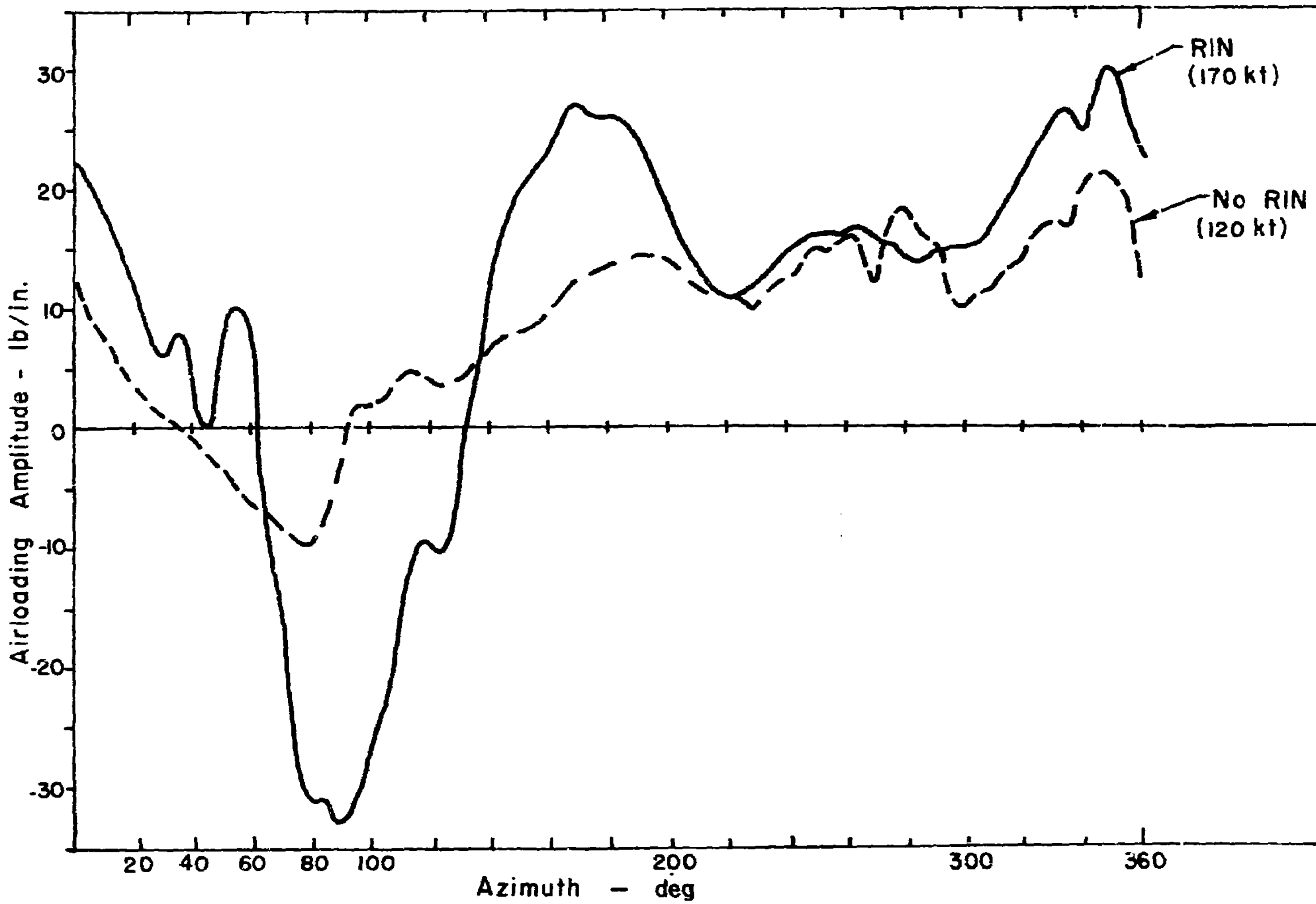


Figure 43. Blade Section Airloading as a Function of Azimuth for Cruise RIN and No-RIN Conditions (98% Span).

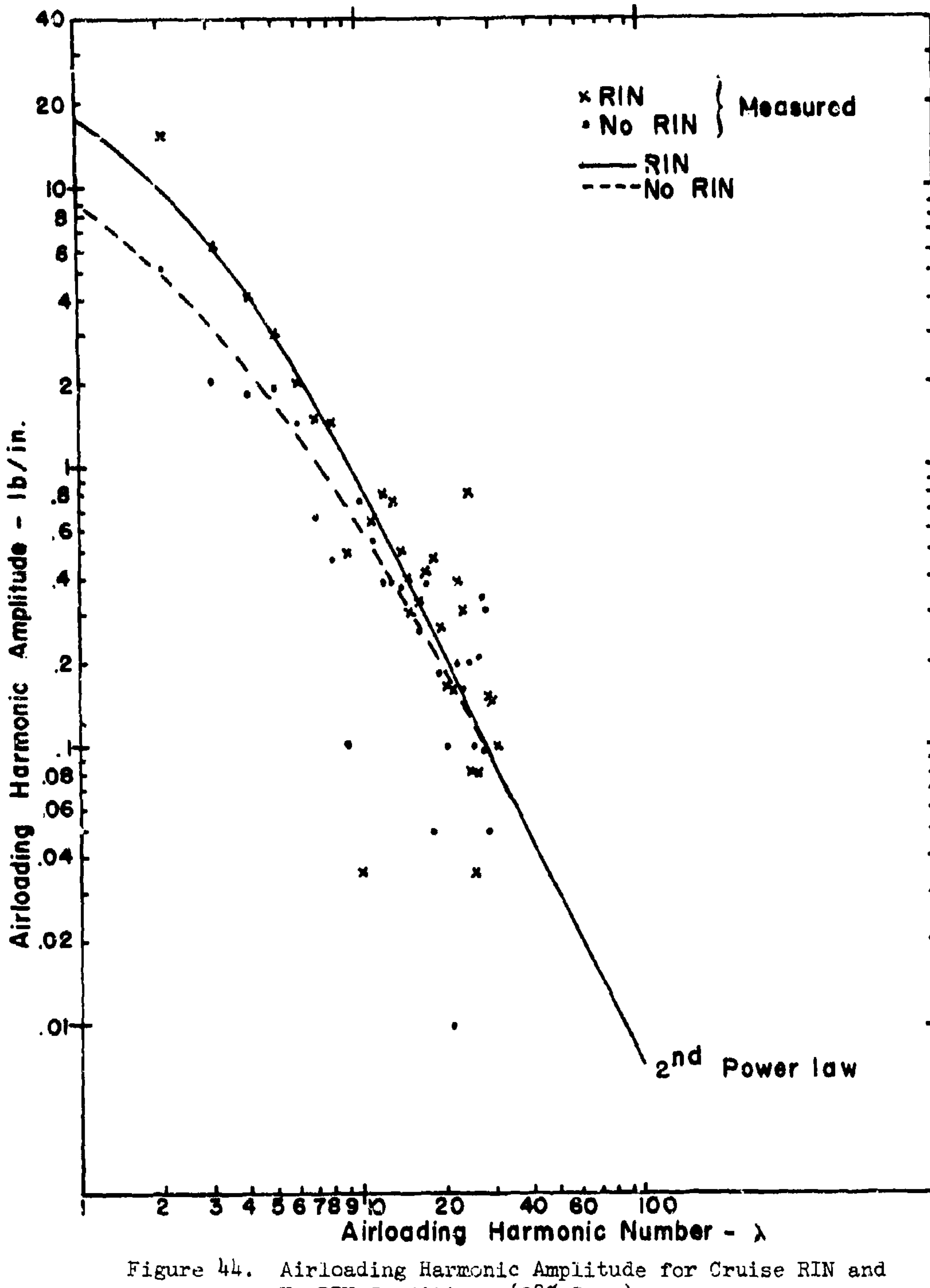


Figure 44. Airloading Harmonic Amplitude for Cruise RIN and No-RIN Conditions (98% Span).

5.0 CONCLUSIONS

Based on the results of this study of rotor impulsive noise (RIN) of a single rotor helicopter, it is concluded that:

1. RIN is characterized by an increase in SPL of the higher harmonics of rotational noise rather than increases in broadband noise amplitude and modulation. Rotor rotational noise harmonics up to the twenty-third (430 Hz) were measured during RIN conditions.

2. Cruise RIN and hover RIN of single-rotor helicopters appear to be generated by different aeroacoustic mechanisms. Cruise RIN results from the combination of acoustic effects of high subsonic tip Mach number and aerodynamic effects of drag divergence. Hover RIN results from high frequency oscillations in airloads commonly caused by blade/wake interactions.

3. Cruise RIN is highly directional, with maximum severity occurring directly ahead of the helicopter at small angles below the plane of the main rotor. The observed directionality of this RIN results from the directionality of drag divergence generated noise (maximum in the plane of the rotor) and the forward shift in directionality in the rotational noise lobes which occurs during high speed translation.

4. Aerodynamic shock effects do not appear to be a primary source of RIN for the helicopter studied.

5. The inclusion of blade flapping and coning in the acoustic analysis does not significantly improve correlation of measured and predicted noise levels.

6. Calculated time histories of acoustic pressure agree with trends in measured cruise data. Calculated and measured impulsiveness increases at 170 knots as the helicopter approaches the observer, while neither the calculated nor the measured waveform is impulsive at 140 knots.

7. Calculated noise harmonic levels correlate with measured data through the third harmonic at moderate distances from the helicopter. Correlation at large distances tends to be poor. Analytical omission of source motion and drag divergence effects seem to be the prime factors contributing to this inaccuracy. Atmospheric scattering of the noise may also be a contributing factor by causing shifts in the highly directional forward radiating patterns.

8. Theoretical airloads predicted from a Sikorsky-developed rotor loads and aeroelastic analysis (which uses a normal modes approach coupled with variable inflow) do not contain sufficient higher-harmonic amplitude and phase information to be useful for detailed acoustic predictions. These theoretical airloads give useful estimates only of the fundamental and the second harmonic of rotor rotational noise.

9. Limited ability of theoretical airload analyses to predict higher-harmonic amplitude and phase suggests that new empirical approaches are required to provide airload data for acoustic predictions.

6.0 RECOMMENDATIONS

Results from this study lead to the following recommendations for future research:

1. Modify the analysis used for the present study to incorporate the acoustic effects of profile drag and source motion. Evaluate improvement in correlation with noise data presented in this report and in Reference 15.

2. Develop a practical analysis for estimating rotor noise without measured airload data. This entails developing an empirical method for predicting airload spectrum shapes from measured rotor load data (such as H-34, NH-3A, CH-53A, and UH-1B data) and developing a computerized subroutine to construct an appropriate airload spectrum for the rotor geometry and flight condition of interest.

3. Improve the accuracy of broadband noise prediction by including the acoustic effects of vortex shedding, boundary layer turbulence, and oncoming vorticity in an acoustic analysis. Such an analysis should include the effects of blade tip geometry on shed vorticity and aerodynamic circulation. The study of basic generating mechanisms of rotor broadband noise currently supported by ARO-Durham under contract DAHC04-69-C-0089 should be invaluable in the recommended study.

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APPENDIX I
COMPUTER PROGRAM MODIFICATION

The computer program described in AVLABS Report 70-1B (Reference 13) was modified during the present study to reduce running time, to include rigid body blade flapping and rotor shaft inclination, and to obtain the time history of acoustic pressure at each location for which rotational noise levels are calculated. Modifications are described below.

I.1 RUNNING TIME

The computer program calculates rotational noise harmonic levels based on any arbitrary pressure distribution on the rotor blades. In order to relate the pressures on the blades to the noise heard by an observer, the pressure profile on a typical section of a blade at any given time is represented by a Fourier series whose coefficients are calculated by numerically integrating the pressure profile over the appropriate interval. Since the pressure profile changes as the blades move azimuthally, the Fourier series coefficients required for each noise harmonic must be calculated several hundred times to define the rotor system as a noise source. The calculation of these Fourier series accounts for 75% of the machine time used in the calculation of each noise harmonic.

These series coefficients are stored in the computer since they are not influenced by locations for which noise levels are calculated. In the original version, the coefficients were stored in the computer core and, consequently, were available only during the running of the program. If inspection of the computer output revealed that different observer locations were required to answer questions about the noise radiation patterns, it was necessary to re-run the program to reproduce the old Fourier series for the new observer locations. In the modified version, the series coefficients are stored on magnetic tape for each rotor operating condition. Machine time on subsequent runs is reduced from more than 150 seconds per noise harmonic to approximately 40 seconds by reading the coefficients from the tape. An input option, DRUM, has been added to specify that coefficients are to be read in from tape.

I.2 RIGID BODY FLAPPING

In the original noise prediction computer program, the rotor disk is represented by a flat plate that lies in a plane parallel to the ground. Directional characteristics of the rotor noise are caused solely by the distribution of aerodynamic forces over the rotor disk and by the pitch angle of the rotor blades as they rotate around the azimuth. Subsequent correlation work using this analysis indicated that correlation should be improved by removing the assumption of a horizontal, flat rotor disk in favor of a more realistic description of the rotor geometry and orientation relative to the ground.

The present study improved the mathematical model of the rotor system by adding rotor shaft fore/aft inclination and rigid-body blade flapping to the noise prediction equations. The sign conventions used are standard

for helicopters (Gessow and Meyers, Reference 14) with shaft inclination angle (θ) positive aft, and blade flapping angle (ϕ) positive above the plane perpendicular to the rotor shaft (Figure 45). These angles are used to define the x, y, and z components of the aerodynamic forces acting on the rotor blades. The effects of these angles on the distance between rotor and observer are neglected since this effect is small for normal helicopter operations.

The solution to the acoustic wave equation that is the foundation of the noise prediction analysis is given in Reference 15 as the relationship

$$P_m[x,y,z,t] = \frac{1}{4\pi}\int_0^b\int_0^R\int_0^{2\pi}\left\{\left\{g_{mx}\frac{\partial}{\partial x} + g_{my}\frac{\partial}{\partial y} + g_{mz}\frac{\partial}{\partial z}\right\}\frac{1}{S}\cos\left\{mn\Omega\left[t - \frac{\psi}{\Omega} - \frac{S}{c}\right]\right\}\right.$$

$$\left. + \left\{h_{mx}\frac{\partial}{\partial x} + h_{my}\frac{\partial}{\partial y} + h_{mz}\frac{\partial}{\partial z}\right\}\frac{1}{S}\sin\left\{mn\Omega\left[t - \frac{\psi}{\Omega} - \frac{S}{c}\right]\right\}\right\} db\,dr\,d\psi$$

where $P_m(x,y,z,t)$ is the m^{th} harmonic of acoustic pressure as a function of time t and observer location (x, y, z) and g_{mx}, g_{my}, g_{mz}, h_{mx}, h_{my}, h_{mz} are related to the components of the aerodynamic forces in the x, y, and z directions as defined in Reference 15.

The flapping motion of the blades introduces radial components of aerodynamic forces in the rotor disk. Fore/aft inclination of the rotor shaft merely changes the orientation of the rotor system relative to the ground. Since both feathering (pitch) and flapping motions are measured with respect to the rotor shaft, it is convenient to develop the analysis in a shaft axis coordinate system (Figure 45). Inclination of the rotor shaft from the vertical then can be accounted for by a simple transformation of coordinates.

Coordinate Convention:

Origin:	Center of rotation
x :	$\perp$ shaft, + = aft ($\psi = 0^\circ$)
y :	$\perp$ shaft, + = starboard side ($\psi = 90^\circ$)
z :	Coincides with shaft axis, + = direction of positive rotor thrust
β :	Pitch angle on blade, + = leading edge up, function of radius and azimuth
ϕ :	flapping angle, + = above x-y plane, function of azimuth only (the blade is not permitted to bend or twist dynamically)
ψ :	Azimuth angle, normal helicopter (ccw from above, 0° on x-axis)

The g_{mx}, h_{mx}, etc.,parameters may be treated as components along each axis

of the aerodynamic forces acting on the rotor blades. For this analysis, aerodynamic forces always are perpendicular to both the chord line and the feathering axis of the rotor blades. These forces are projected onto the z-axis directly and onto the x-y plane as radial and azimuthal components. If F is the aerodynamic force vector as shown in Figure 46, then the radial component, F_R, is $F_R = |\vec{F}| \cos\beta \sin\phi$; the azimuthal component, F_A, is $F_A = |\vec{F}| \sin\beta$; and the vertical component, F_Z, is $F_Z = |\vec{F}| \cos\beta \cos\phi$. x- and y-axis components of $\vec{F}$ are easily found from the azimuthal and radial components

$$F_x = F_A \sin\psi - F_R \cos\psi$$

$$F_y = -\left(F_A \cos\psi + F_R \sin\psi\right)$$

$$F_z = |\vec{F}| \cos\beta \cos\phi$$

The above relationships translate into acoustic wave equation terminology as follows, where g_m is the magnitude of the unresolved aerodynamic force

$$g_{mx} = g_m\left(\sin\beta \sin\psi - \cos\beta \sin\phi \cos\psi\right)$$

$$g_{my} = -g_m\left(\sin\beta \cos\psi + \cos\beta \sin\phi \sin\psi\right)$$

$$g_{mz} = g_m \cos\beta \cos\phi$$

with analogous results for the h_m terms.

I.3 INCLINATION OF ROTOR SHAFT

The preceding equations are valid in the shaft-axis coordinate system, but this reference frame is not convenient for application to the noise prediction computer program. Consequently, the equations have been transformed from the shaft axis coordinate system to a more convenient system with the x-y plane parallel to the ground and z normal to the x-y plane (positive above this plane). By considering only fore/aft shaft inclination, the transformation consists of simple rotation about the y-axis. Using primed symbols for the shaft-axis system and unprimed for the transformed coordinates, the result is

$$x = x'\cos\theta + z'\sin\theta$$

$$y = y'$$

$$z = z'\cos\theta - x'\sin\theta$$

Consequently,

$$g_{mx} = g'_{mx} \cos\theta + g'_{mz} \sin\theta$$

$$g_{my} = g'_{my}$$

$$g_{mz} = g'_{mz} \cos\theta - g'_{mx} \sin\theta$$

so that the final result for g_m (or h_m) with the addition of flapping and longitudinal shaft tilt is

$$g_{mx} = g_m \left\{ \cos\theta \left(\sin\beta \sin\psi - \cos\beta \sin\phi \cos\psi \right) + \sin\theta \cos\beta \cos\phi \right\}$$

$$g_{my} = g_m \left\{ -\cos\beta \sin\phi \sin\psi - \sin\beta \cos\psi \right\}$$

$$g_{mz} = g_m \left\{ \cos\theta \cos\beta \cos\phi + \sin\theta \left(\cos\beta \sin\phi \cos\psi - \sin\beta \sin\psi \right) \right\}$$

The flapping and shaft tilt terms from g_m and h_m propagate through the analysis and ultimately influence only one basic term in the equations. That term, q_1, accounts for direction and distance from the rotor system to an observer location.

$$q_1 = \left[x - r\cos\psi \right] \left\{ \cos\theta \left[\sin\beta \sin\psi - \cos\beta \sin\theta \cos\psi + \sin\theta \cos\beta \cos\phi \right] \right\}$$

$$- \left[y - r\sin\psi \right] \left\{ \cos\beta \sin\phi \sin\psi + \sin\beta \cos\psi \right\}$$

$$+ z \left\{ \cos\theta \cos\beta \cos\phi + \sin\theta \left[\cos\beta \sin\phi \cos\psi - \sin\beta \sin\psi \right] \right\}$$

I.4 ACOUSTIC PRESSURE TIME HISTORY

In previous correlation studies of rotor rotational noise (References 2 and 15), the root-mean-square sound pressure level (SPL) in decibels was the critical parameter. The present study has included the time history of acoustic pressure to determine how well the analysis predicts both amplitude and phase of the noise harmonics. The addition of the time history to the computer program was straightforward since the required acoustic parameters, u_m and v_m, are calculated for the rms SPL. The

acoustic pressure of the m^{th} harmonic as a function of time is given as

$$p_m[t] = u_m \cos m\omega t + v_m \sin m\omega t$$

where ω is the blade passage frequency. The total acoustic pressure, P(t), can be constructed from

$$P[t] = \sum_{m=1}^{\infty} u_m \cos m\omega t + v_m \sin m\omega t$$

The computer program now divides the blade passage period into 40 segments to define the time history of acoustic pressure.

I.5 USE OF ROTATIONAL NOISE PREDICTION COMPUTER PROGRAM

The program calculates the root-mean-square (SPL) of up to 10 harmonics of rotor rotational noise at as many as 20 observer locations relative to the rotor system. The time history of acoustic pressure also is calculated.

Calculated noise levels can be based on different chordwise distributions of airloading. Flight test aerodynamic data are used whenever possible, so the chordwise distribution is arbitrary and reflects the effects of stall, compressibility, reversed flow, and blade wake interactions. Use of an arbitrary distribution without flight data requires the user to fabricate pressures that give the desired distribution.

Subroutine E386RN is provided to calculate noise levels based on a hypothetical constant airload across the blade chord. This subroutine is much faster and less complicated than the calculation procedure for an arbitrary chordwise distribution of load. The time history of acoustic pressure is not calculated when subroutine E386RN is used alone.

I.5.1 Hardware Requirements

The program was written in FORTRAN V specifically for use on the Univac 1108 system operated by the United Aircraft Research Laboratories (UARL). The program uses direct access input/output FH-332 drums, units 28 through 30, to manipulate data. One tape drive unit, number 14, is required to store or recall the Fourier series coefficients discussed in Section I.1. If the noise prediction program is to be run on a different computer, an analyst must go over the source deck to make the input/output calls compatible with available hardware. Without using overlay techniques, the program uses approximately 50,000 decimal words of storage.

I.5.2 Software Requirements

The program uses two software packages that are uniquely suited to the UARL system. One package, called NTRAN, was used in the original version of the noise prediction program. This routine allows the 1108 computer to proceed with calculations while parameters are being read into core or written out onto a storage file. While this feature is standard for the

1108, different computer installations may have a different name or call argument for the routine than the UARL system. All calls to NTRAN occur in the part of the program called E676. The other software package that is tailored to UARL's system is called Drum Data Transfer (DDT). This routine was added during the present study to expedite storage and retrieval of the coefficients discussed in Section I.1. The remainder of the present section describes where DDT is used in the program and outlines the requirements that a substitute storage/retrieval routine must satisfy.

Coefficients named GMAR and HMAR are calculated for each noise harmonic and are a function of the aerodynamic loading on the rotor blades. For each noise harmonic, there are 720 values of GMAR and 720 values of HMAR (144 azimuthal locations per spanwise location times 5 spanwise locations). Since the program is designed to calculate as many as 10 harmonics of noise, the storage system must accommodate 14,400 coefficients. Storage format should be conducive to retrieving all of the coefficients for a given noise harmonic at the start of the major loop on noise harmonics in E676.

The statements in the noise prediction computer program that involve DDT operations are identified below by the sequence numbers that are punched in the last 8 columns of each card. Comment cards precede each DDT operation to explain its purpose. The first 4 characters, L76M, label the cards as part of the main program E676. In the program version presented in Appendix V, statements for DDT operations have been changed to comment cards by placing a "C" in column 1. The relevant cards are: L76M0910, L76M2750, L76M3600 through L76M3640, L76M4020, L76M4890, L76M4900, L76M4920, and L76M4930.

Note that cards L76M2750, L76M4890, and L76M4900 use DDT when the DRUM input mode is not used. The computer program can be used without developing a substitute for DDT by deleting these 3 cards and using the CARD input mode. Section I.5.4 defines input parameters and illustrates proper placement on punched cards.

I.5.3 Data Requirements

Input data describe rotor geometry and flight condition, observer location relative to the rotor system, and aerodynamic loads acting on the rotor blades. These data are read from cards for each run or are built into the program in the block data subroutine BLODAT. Section I.5.6 discusses some features of this subroutine that might affect use of the program for a rotor system other than the CH-53A rotor that was used for this study. Output data normally consists of:

1. A display of input values including differential pressure as a function of azimuth for each chordwise and spanwise location on the blade.

2. A listing of Fourier series coefficients (Section I.1) as a function of azimuth for each span location and each noise harmonic.

3. A listing of the oscillatory components of acoustic pressure used in the final equation of section I.4.

4. A listing of SPL as a function of observer location for each noise harmonic.

I.5.4 Input Parameters and Format

The programming names of input parameters and their appropriate units are indicated in this section. Placement of these parameters on punched cards is illustrated in Figure 47. Figure 43 shows actual values in a complete sample data set for the CARD input mode. Numerical values of the input parameters must contain a decimal point unless an integer is specified.

BB	Maximum blade thickness; inches.
AA	Blade chord length; inches, assumed constant along the blade span.
BLADEL	Blade length (radius); inches, measured from center of rotation.
GAMA	Blade twist rate (linear); degrees per inch, positive value for normal negative twist from root to tip.
RO	Blade radial location where twist starts; inches, normally taken to be reference radius for blade pitch angle.
CC	Speed of sound in air; inches per second.
OMEG	Rotational speed of rotor; revolutions per minute.
DPSI	Azimuth angle increment for calculations; degrees, can be 1.25 degrees of multiple of 2.50 degrees.
NBLADE	Number of rotor blades; integer.
MLIMDP	Number of harmonics of blade pressure to be input, not greater than 30; integer.
MLIMRN	Highest noise harmonic order to be calculated, not greater than 10; integer.
LSPAN	Number of interpolated equidistant radial stations used in noise calculations, equals 10 or 20 only; integer.
IREELS	Number of input data tapes (not greater than 5), normally left equal to 1; integer.
TCOP	Option to read aerodynamic data from punched cards (CARD), or magnetic tape or fastran drum (DRUM); alphanumeric.
PUNCH	Option to punch aerodynamic pressure harmonics on cards, normally left N; alphanumeric.
INTERM	Option for intermediate output, left N; alphanumeric.
IDD	Option for intermediate output, left blank or 0 (zero); integer.
RR(IN)	Instrumented radial stations in terms of decimal fraction of span for IN = 1 (closest to root) to IN = 5 (closest to blade tip).
XA(IN,JN)	Instrumented chordwise in terms of decimal fraction of chord at chord locations JN = 1 (closest to leading edge) to JN = 5 (closest to trailing edge) for each span IN.

TIME — Time interval over which acoustic pressure is calculated, normally equals period of blade passage frequency (seconds per cycle); seconds.

THETA — Fore-aft inclination of main rotor shaft from Z-axis, negative for forward inclination; degrees, autogyro sign convention.

E3860P — Option to calculate noise based on constant chordwise load distribution, Y for yes or N for no; alphanumeric.

OPRONO — Option to calculate noise based on arbitrary chordwise distribution of airload, equals Y for yes or N for no.

Note: E3860P and OPRONO must not be Y simultaneously since OPRONO results will be meaningless due to an equivalencing of certain variables.

NFT — Number of observer locations at which noise levels are to be calculated, not greater than 20; integer.

Note: The parameters ANG, NHH, KEY 1, KEY 2, and KEY 3 are required only E3860P equals Y, in which case OPRONO must equal N.

ANG — Azimuthal increment used to calculate noise with E386RN; degrees, must satisfy (360/ANG) = even integer number, and ANG not less than 0.5 degree.

NHH — Number of section load harmonics to be calculated from input pressure harmonics, normally equal to or less than MLIMDP; integer.

KEY 1, KEY 2, KEY 3 — Options for intermediate printout from E386RN, left equal to zero; integer.

Note: Observer locations are specified in spherical coordinates (CAPRF, THETAF, ALFAF) when E3860P equals Y and in rectangular coordinates (XFP, YFP, ZFP) when OPRONO equals Y. Origin of both systems is the rotor hub.

CAPRF — Line-of-sight distance from rotor hub to observer; feet.

THETAF — Azimuthal location of observer relative to rotor; degrees, normal helicopter azimuth convention.

ALFAF — Elevation angle of observer relative to rotor plane; degrees, negative for observer below rotor plane.

XFP — X-axis location of observer (parallel to THETAF equal zero); inches from rotor hub, positive along THETAF = 0.0° and negative along THETAF = 180.0° (ahead of helicopter).

YFP — Y-axis location of observer; inches, positive along THETAF = 90°.

ZFP — Z-axis location of observer; inches, positive along ALFAF = 90° (thrust axis of hovering rotor).

IBURST — Number of the data set being processed, significant only when TCOP equals TAPE; integer.

Note: The following parameters are not required if the DRUM input mode is used.

BO — Steady component of blade pitch angle; degrees.

B1C First harmonic cosine component of blade pitch angle; degrees, defined for a positive series.

B1S First harmonic sine component of blade pitch angle; degrees, defined for a positive series.

FO Steady component of blade flapping angle (also called coning angle); degrees, positive for flapping up.

F1C First harmonic cosine component of oscillatory flapping; degrees, defined for a positive series.

F1S First harmonic sine component of oscillatory flapping; degrees, defined for a positive series.

CN(K,JN,IN) Cosine component of kth harmonic of differential pressure at chord JN and span IN; pounds per square inch, defined for positive series.

SN(K,JN,IN) Sine component of kth harmonic of differential pressure; as above.

K Order of harmonic of differential pressure, between 1 (steady) and 31 (30th oscillatory component); integer.

JN Location along blade chord between 1 (closest to leading edge) and 5 (closest to trailing edge); integer.

IN Location along blade span between 1 (closest to root) and 5 (closest to tip); integer.

During normal operation, the first run for a given operating condition will use aerodynamic pressure data on punched cards. This is indicated by placing the word CARD in the space allotted to variable TCOP. By saving the Fourier coefficients that describe the chordwise distribution of differential pressure, subsequent runs for the same flight condition will require relatively few data cards. To use coefficients from a previous run, the word DRUM is placed in the TCOP location, and the appropriate data are read in via unit 14. Figure 49 shows sample data for the DRUM input mode where data are read from the 4th file of tape "G" (unit 14).

I.5.5 Output Data

Figure 50 contains a typical computer output from rotational noise prediction program E676. Values of differential pressure are printed every 2.5 degrees of azimuth from 0^{o} through 357.5^{o}. These listing are read line-by-line from left to right. Fourier coefficients are listed after the differential pressures with cosine coefficients followed by sine coefficients for each span location (blade station) and each noise harmonic. The first line of cosine coefficients is indented 3 spaces,as is the first line of sine coefficients. These listings are read the same way as the differential pressure listings. Oscillatory components of acoustic pressure are listed next for each observer location, followed by the time history of acoustic pressure at each observer location (field point). These acoustic pressures are read line-by-line from left to right. The 1st value is the acoustic pressure at some arbitrary time t = 0, and the 41st value is the pressure at the time t = T (the period of the blade passage frequency). The value at t = T should nearly equal the value at t = 0 if the time interval, TIME, is equal to (1/blade passage frequency). Rotational noise levels as a function of field point for each noise harmonic are the last parameters to be printed out.

I.5.6 Changes to Subroutine BLODAT

Subroutine BLODAT contains numerical values that normally do not change from run to run. The program is designed to accept aerodynamic pressure data at 5 chord stations for each of 5 span stations, and the status of each of these locations is defined in BLODAT by parameters IRS(I) and NCHAN(I,J). If no data are available for a given chord or span location, changes are required to IRS(I) or NCHAN(I,J), or to both. Since the transducer at the 4th chord location of the 1st span location was inoperative during the present study, NCHAN(1,4) = 0 to indicate that no data would be input for that position. This also tells the program to use an averaged quadratic integration technique in all chordwise integrations at the 1st span location. For normal use, NCHAN(1,4) should be changed to 4. The proper format for these parameters is shown in the listing of the program (Appendix V).

I.5.7 Running Time and Page Requirements

Approximately 2.5 minutes of machine time should be allowed for each noise harmonic when the CARD input mode is used. This is reduced to approximately 0.6 minute per harmonic when the DRUM input mode is used. To be conservative, allow for 50 pages of output.

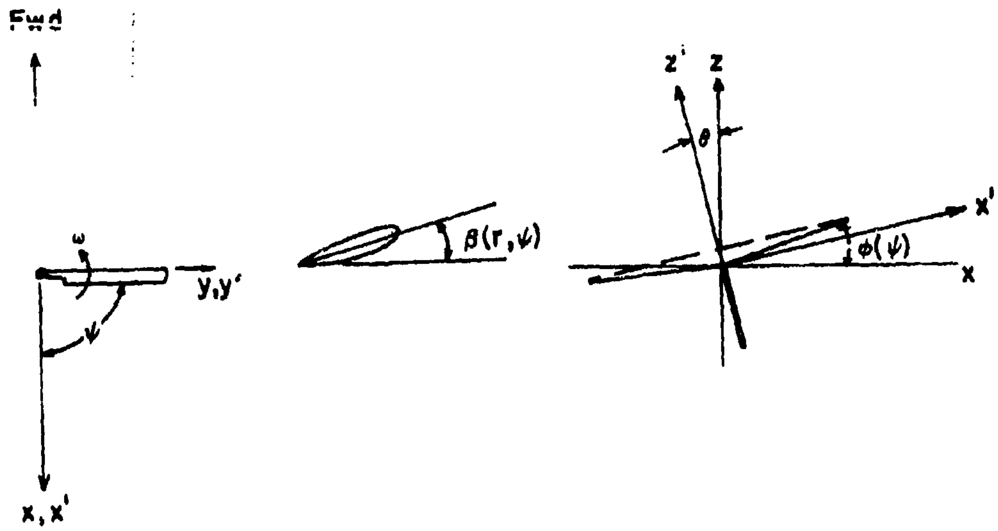

Figure 45. Coordinate Systems for Rotor Noise Calculation.

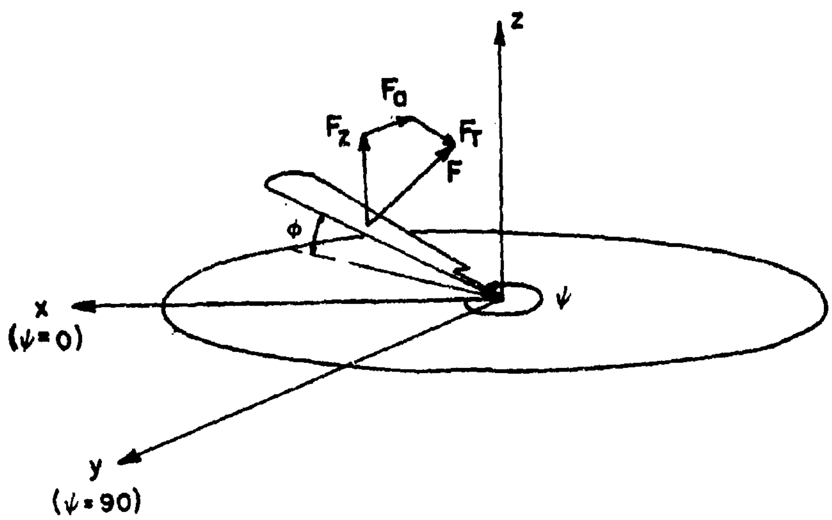

Figure 46. Resolution of Aerodynamic Forces.

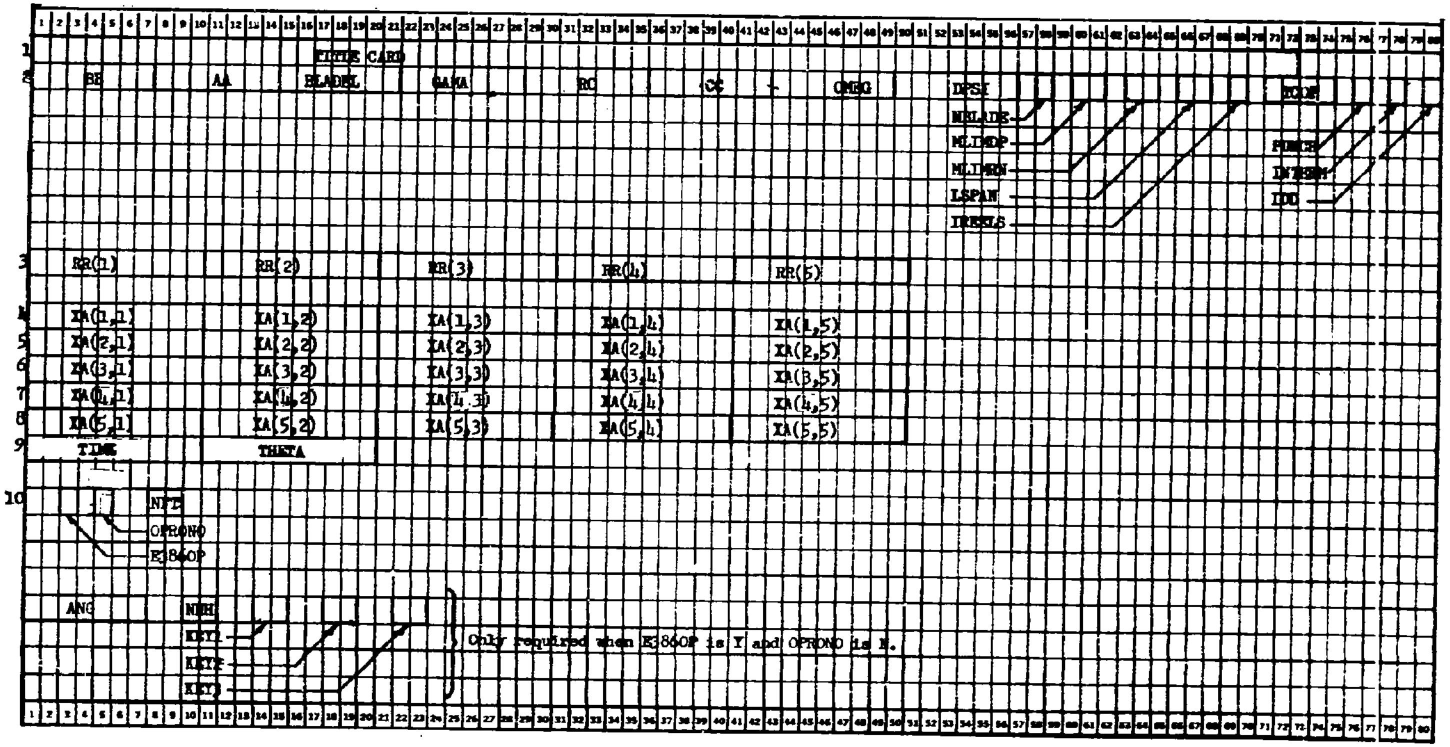

Figure 47. Placement of Parameters on Cards.

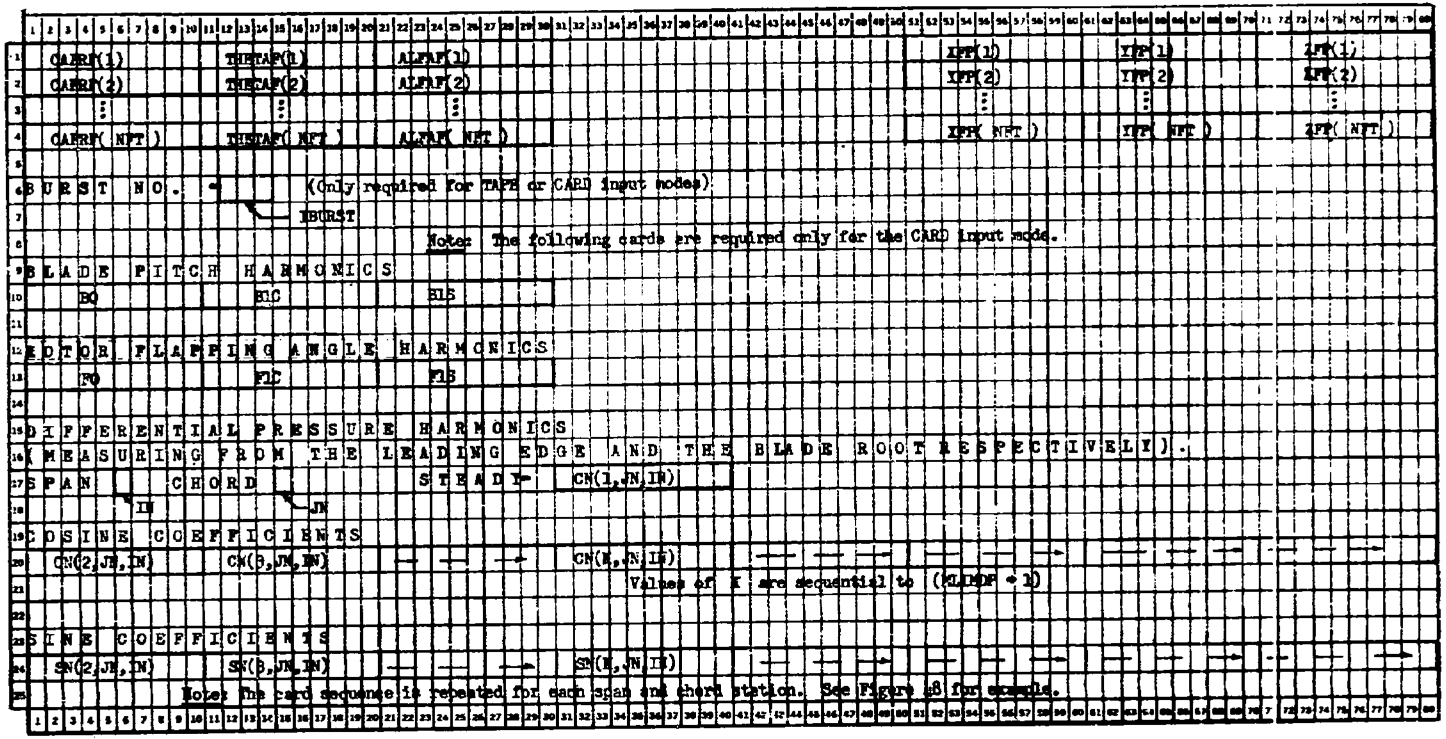

Figure 47. Concluded.

```
@ RUN E676W0441167609005000050        (633) DAUSCH.W    3     STATION***
@P   ASG   P
@P   ASG   S
@P   ASG   G=9362SY
@ XQT CUR
  FRS
  THF NOISE
  PFF G,G,G
@ XQT AF676
 E676 SAMPLE DECK SET-UP  20AUGUST70 TCOP = CARD
 2.86    26.0    433.4   .0131  118.0  13270. 188.     2.5    6   8   5 20 1 CARD N N
  .4          .75          .85          .95          .98
 .042        .158        .3           .6           .91
 .042        .158        .3           .6           .91
 .042        .158        .3           .6           .91
 .042        .158        .3           .6           .91
 .042        .158        .3           .6           .91
 .0531       0.0
  N Y    2
 538.52   0.          -30.                                       5596.        0.        -3231.
 538.52   0.          -5.                                        6438.        0.        -563.
BURST NO. =  7           *** ROTOR NOISE PUNCHED OUTPUT ***
BLADE PITCH HARMONICS
 1.3133+01 1.2684+00 1.4096+00  (COLLECTIVE, LONGITUDINAL, LATERAL RESPECTIVELY)
ROTOR FLAPPING ANGLE HARMONICS
 3.4965+06-9.2093-01 0.0000       (POSITIVE TAIL HIGH -- DEGREES)
DIFFERENTIAL PRESSURE HARMONICS FOR 5 CHORD STATIONS AT EACH OF THE 5 SPANS
(MEASURING FROM THE LEADING EDGE AND THE BLADE ROOT RESPECTIVELY).
SPAN 1  CHORD 1          STEADY=  1.3215+00
COSINE COEFFICIENTS
 1.7893-01 8.6379-02-9.1522-02 5.4074-02-1.4760-02 1.3739-02-3.2843-03 6.8900-03
SINE COEFFICIENTS
 2.5822-01 1.2173-01-7.8300-02 1.6145-02-2.9130-02 2.6313-02-8.1456-03 1.4022-02
SPAN 1  CHORD 2          STEADY=  5.2611-01
COSINE COEFFICIENTS
 6.3769-02 2.6989-02-2.6319-02 2.2534-02-1.1330-02 2.8705-03-8.5509-04 4.2238-03
SINE COEFFICIENTS
 1.0326-01 4.1014-02-2.4542-02 7.6643-03-4.6196-03 8.0601-03 7.9350-03 7.4742-03
SPAN 1  CHORD 3          STEADY=  2.7584-01
COSINE COEFFICIENTS
 5.3880-02 2.8974-02-2.9560-02 9.6782-03-6.2573-03 3.0683-03 1.4864-03 3.5357-03
SINE COEFFICIENTS
 7.3465-02 3.2867-02-1.2936-02 5.3314-03-6.4602-03 6.6668-03-7.8706-04 3.6909-03
SPAN 1  CHORD 4          STEADY=  0.0000
COSINE COEFFICIENTS
 0.0000    0.0000    0.0000    0.0000    0.0000    0.0000    0.0000    0.0000
SINE COEFFICIENTS
 0.0000    0.0000    0.0000    0.0000    0.0000    0.0000    0.0000    0.0000
SPAN 1  CHORD 5          STEADY= -5.6346-02
COSINE COEFFICIENTS
-9.4211-03-4.8721-03 3.1423-03-3.3696-04-2.9359-05 4.4270-04-2.7112-04-9.1695-04
SINE COEFFICIENTS
-8.4587-04-4.6024-03 8.6568-05-1.6911-03 2.1953-03-3.2855-04 1.5774-04-2.6268-04
SPAN 2  CHORD 1          STEADY=  3.5155+00
COSINE COEFFICIENTS
 6.2205-01-5.0632-02 1.4693-02 3.2436-02-6.0388-02 2.5522-02-1.7416-03-5.5072-03
SINE COEFFICIENTS
 6.4991-01 1.7020-01 3.8880-02 8.0048-02 3.4875-03 1.5879-02 1.3939-02-4.9721-04
SPAN 2  CHORD 2          STEADY=  1.4074+00
COSINE COEFFICIENTS
```

Figure 48. Sample of CARD Input Mode.

```
 2.9125-01-1.4134-03 6.7889-03 2.1101-02-3.0086-02 1.3893-02-5.0205-03-1.6058-03
SINE COEFFICIENTS
 2.4252-01 7.7975-02 1.6632-02 3.2862-02 1.3079-02 7.4412-03 7.4750-03 5.3284-03
SPAN 2  CHORD 3        STEADY=  1.1239+00
COSINE COEFFICIENTS
 1.4021-01-2.5537-02 7.3251-04 1.2601-02-1.5888-02 6.8869-03 1.0343-04 2.9860-03
SINE COEFFICIENTS
 1.4063-01 3.6232-02 7.2472-03 2.2703-02-3.6062-04 7.2413-03 3.5772-03-4.5975-04
SPAN 2  CHORD 4        STEADY=  2.7872-01
COSINE COEFFICIENTS
 8.4155-02 2.6385-03-2.0558-03 9.6918-03-8.3669-03 9.2523-04-7.9473-04-2.9648-03
SINE COEFFICIENTS
 4.7117-02 2.0689-02 6.5795-03 5.4138-03 1.1244-02 4.4744-03 3.3201-03-6.1514-04
SPAN 2  CHORD 5        STEADY= -1.6337-01
COSINE COEFFICIENTS
 2.6125-02 3.8526-03-1.3509-03 3.7271-03-2.7216-03 6.2714-04 6.4998-04-1.5116-03
SINE COEFFICIENTS
-1.3585-02 4.4238-03-3.3623-03-1.4518-03 4.5007-03 2.1445-04 1.2701-03 4.2440-04
SPAN 3  CHORD 1        STEADY=  4.5398+00
COSINE COEFFICIENTS
 9.1344-01 2.4672-02-9.5280-02-6.1585-02-1.5801-01 5.5602-03 9.4039-02 1.1364-01
SINE COEFFICIENTS
 6.0212-01 1.9442-01 1.7576-02-4.8439-03 1.3575-01 7.2371-02 6.9967-02-6.1871-02
SPAN 3  CHORD 2        STEADY=  5.1488-01
COSINE COEFFICIENTS
 3.1920-01 3.6656-02-2.4089-02 3.2477-02-4.0168-02 3.1908-03 1.3488-02 9.5870-03
SINE COEFFICIENTS
 6.9666-02 9.5417-02 9.9914-03 1.6957-02 2.9003-02-2.0850-03 3.1961-03-3.1983-03
SPAN 3  CHORD 3        STEADY= -3.7077-01
COSINE COEFFICIENTS
 9.4995-02 5.2003-02-2.9669-02 1.2778-02-1.2519-02 9.4363-04 5.9984-03-1.5821-03
SINE COEFFICIENTS
-2.2669-03 6.2634-02-2.6832-03 1.3001-02 2.2155-02 4.6875-03-4.3110-03-6.0489-03
SPAN 3  CHORD 4        STEADY=  1.1764+00
COSINE COEFFICIENTS
 5.5060-03 1.5338-02-1.7025-02 1.1994-02-3.1227-04-1.0326-04 1.0875-03-8.7683-03
SINE COEFFICIENTS
-3.8908-02 2.8985-02-2.4007-04 1.0648-02 6.8600-03 8.6288-04-9.1648-03-7.1324-05
SPAN 3  CHORD 5        STEADY=  2.0242-01
COSINE COEFFICIENTS
 3.1762-03 4.9851-03-2.5603-03 5.8589-03 2.8196-03-4.5628-04-2.1767-04-5.9044-03
SINE COEFFICIENTS
-2.3438-02 9.5578-03 9.9387-04 3.4870-03 9.5972-04 7.8844-04-6.8262-03 9.5167-04
SPAN 4  CHORD 1        STEADY=  9.5341+00
COSINE COEFFICIENTS
-1.3684+00-8.4312-01-1.9837-01-2.4799-01-1.9390-01 7.3308-02 4.8595-02 5.4914-03
SINE COEFFICIENTS
-7.3405-01-8.1310-01 9.9605-02 2.6595-01 4.6046-02 4.8517-04-8.7989-03-1.4977-01
SPAN 4  CHORD 2        STEADY=  3.8796+00
COSINE COEFFICIENTS
-1.1079+00-3.8811-01-6.3380-02-1.2579-01-1.7367-01 1.2701-01 1.3918-01-4.6663-02
SINE COEFFICIENTS
-3.5022-01-6.0494-01 1.0944-01 1.7018-01 1.4051-01-6.0502-02 6.5529-02-8.6124-02
SPAN 4  CHORD 3        STEADY=  1.7704+00
COSINE COEFFICIENTS
-2.6249-01-1.9883-01-5.1591-02-7.2592-02-3.6821-02 4.2362-02 1.6471-02 1.0313-02
SINE COEFFICIENTS
-1.9704-01-2.0230-01-4.3912-02 1.1520-01 1.1838-02 1.8821-02 9.7173-03-6.5188-02
SPAN 4  CHORD 4        STEADY=  4.3502-01
COSINE COEFFICIENTS
```

Figure 48. Continued.

```
-4.8628-02-4.7619-02-1.2670-02-7.7182-03-1.3397-02 1.3703-02 1.8237-02 1.3705-03
SINE COEFFICIENTS
-9.6418-02-4.2627-02-2.2180-02 4.0290-02 1.2906-02 3.3787-04-7.7343-03-1.2327-02
SPAN 4  CHORD 5         STEADY= -3.7936-01
COSINE COEFFICIENTS
-8.4917-03-8.8517-03 9.6144-05-9.2092-04 6.0998-03 9.5912-03 2.2058-03 1.9945-03
SINE COEFFICIENTS
-4.7729-02-1.7351-02 7.0737-03 1.0094-02 2.9334-03 4.6809-04-5.7162-03-3.8534-03
SPAN 5  CHORD 1         STEADY=  9.8304+00
COSINE COEFFICIENTS
-1.6596+00-1.2404+00-6.6369-01-3.8059-01-1.1047-01-2.8423-02-5.4526-03 1.0968-02
SINE COEFFICIENTS
-6.8719-01-8.1859-01-1.1993-01 8.5975-02 3.3376-02 3.7790-02-4.4579-02-2.0696-02
SPAN 5  CHORD 2         STEADY=  2.5259+00
COSINE COEFFICIENTS
-3.7722-01-2.8959-01-1.1734-01-7.2880-02-6.9081-02-7.7209-03 5.1103-03 2.5126-03
SINE COEFFICIENTS
-9.8361-02-2.0992-01-6.1597-02 2.7910-02 1.4647-02-3.3070-03 3.4487-03-3.0249-02
SPAN 5  CHORD 3         STEADY=  1.2639+00
COSINE COEFFICIENTS
-2.4124-01-2.1881-01-8.3634-02-4.0030-02-4.7826-02 1.4367-02 1.9826-02 1.0908-02
SINE COEFFICIENTS
-1.5178-01-1.7806-01-4.8001-02 2.7917-02 1.3979-02-6.2191-03 2.4727-03-2.9592-02
SPAN 5  CHORD 4         STEADY=  4.7708-01
COSINE COEFFICIENTS
-7.9225-02-7.4821-02-2.3488-02-1.1087-02-2.3349-02 5.1036-03 6.3273-03 8.4353-03
SINE COEFFICIENTS
-7.1022-02-6.8677-02-2.6652-02 7.5530-03 1.0709-03-3.9655-03 6.1016-03-8.4271-03
SPAN 5  CHORD 5         STEADY=  1.8145-01
COSINE COEFFICIENTS
-7.0866-02-6.5144-02-1.4039-02-5.5659-03-8.1222-03 9.7118-03 1.1004-02 7.8894-03
SINE COEFFICIENTS
-7.9007-02-7.2525-02-1.2389-02 2.1958-02 3.9799-03-3.4117-03-2.4317-03-5.3973-03
@ XQT CUR
   TEF 0
   TRI 0
@ FIN
```

Figure 48. Concluded.

```
@ RUN E676WN4411676090020000S0        (633) DAUSCH,W    3      STATION''I''
@C    ASG    P
@C    ASG    S
@C    ASG    0=9362SN
@ XQT CUR
    ERS
    INE NOISE
    DEF 0,0,0
    IN 0
    TRI 0
@ XQT AE676
 E676 SAMPLE DECK SET-UP  20 AUGUST 70 TCOP=DRUM
 2.86    26.0    433.4   .0131   118.0   13270. 188.     2.5    6   8   5 20 1 DRUM N N
  .4          .75          .85          .95          .98
  .042        .158         .3           .6           .91
  .042        .158         .3           .6           .91
  .042        .158         .3           .6           .91
  .042        .158         .3           .6           .91
  .042        .158         .3           .6           .91
 .0531        0.0
  N Y    2
 538.52   0.          -30.                                   5596.       0.        -3231.
 538.52   0.          -5.                                    6438.       0.        -563.
@ FIN
```

Figure 49. Sample of DRUM Input Mode.

```
                              E676 SAMPLE DECK SET-UP  20AUGUST70 TCOP = CARD
BLADE THICKNESS (IN)      =   .2860+01       ZERO TWIST BLADE STA.    (IN)     =   .1180+03
BLADE CHORD     (IN)      =   .2600+02       SPEED OF SOUND           (IN/SEC) =   .1327+05
BLADE LENGTH    (IN)      =   .4334+03       ROTOR ROT. SPEED         (RPM)    =   .1880+03

BLADE TWIST RATE (DEG/IN) =   .1310-01       AZIMUTH INCREMENT        (DEG)    =   .2500+01
NUMBER OF BLADES                             =  6     TAPE / CARD / DRUM  OPTION        = CARD
NO. OF HARMONICS TO REPRESENT PRESSURE CYCLES =  8     PRESSURE HARMONIC PUNCH OPTION    = N
NO. OF ROTOR NOISE HARMONICS                 =  2     INTERMEDIATE OUTPUT OPTION        = N
NO. OF INTERPOLATED SPAN STATIONS            = 20
TOTAL NO. OF TAPE REELS                      =  1

COMBINED ROTOR SHAFT INCLINATION AND FUSELAGE PITCH ATTITUDE =   .0000     DEGREES
TOTAL TIME FOR ACOUSTIC PRESSURE COMPUTATIONS IS   .5310-01  SECONDS
OPTION TO USE PROGRAM E386 (THEORETICAL CONST. PRESSURE PULSE)      = N
OPTION TO USE ROTOR NOISE PROGRAM (MEASURED PRESSURE PULSE)         = Y
NO. OF FIELD POINTS                                                 = 2

                    E386 FIELD POINTS                                   ROTOR NOISE FIELD POINTS
FP        R (FT)      THETA (DEG)  ALPHA (DEG)         FP        X (IN)      Y (IN)       Z (IN)
1          .0000        .0000        .0000              1       .5596+04     .0000      -.3231+04
2          .0000        .0000        .0000              2       .6438+04     .0000      -.5630+03
```

Figure 50. Sample Output.

DIFFERENTIAL PRESSURE CYCLES AT INSTRUMENTED BLADE STATIONS

SPAN STATION 1 CHORD STATION 1

1.5519+00	1.5683+00	1.5824+00	1.5939+00	1.6028+00	1.6093+00	1.6138+00	1.6170+00	1.6195+00	1.6222+00
1.6259+00	1.6312+00	1.6386+00	1.6484+00	1.6604+00	1.6744+00	1.6900+00	1.7063+00	1.7227+00	1.7381+00
1.7520+00	1.7634+00	1.7719+00	1.7771+00	1.7789+00	1.7773+00	1.7724+00	1.7646+00	1.7541+00	1.7413+00
1.7264+00	1.7097+00	1.6911+00	1.6707+00	1.6485+00	1.6242+00	1.5979+00	1.5695+00	1.5391+00	1.5069+00
1.4734+00	1.4390+00	1.4044+00	1.3703+00	1.3374+00	1.3062+00	1.2774+00	1.2512+00	1.2278+00	1.2072+00
1.1890+00	1.1730+00	1.1586+00	1.1454+00	1.1331+00	1.1215+00	1.1105+00	1.1005+00	1.0921+00	1.0859+00
1.0829+00	1.0841+00	1.0905+00	1.1026+00	1.1211+00	1.1460+00	1.1769+00	1.2130+00	1.2529+00	1.2950+00
1.3372+00	1.3773+00	1.4132+00	1.4428+00	1.4644+00	1.4766+00	1.4787+00	1.4706+00	1.4526+00	1.4257+00
1.3914+00	1.3514+00	1.3076+00	1.2621+00	1.2168+00	1.1733+00	1.1330+00	1.0969+00	1.0654+00	1.0388+00
1.0168+00	9.9904-01	9.8489-01	9.7366-01	9.6469-01	9.5741-01	9.5139-01	9.4636-01	9.4221-01	9.3898-01
9.3680-01	9.3584-01	9.3626-01	9.3815-01	9.4154-01	9.4632-01	9.5232-01	9.5925-01	9.6681-01	9.7470-01
9.8265-01	9.9053-01	9.9829-01	1.0060+00	1.0140+00	1.0226+00	1.0322+00	1.0432+00	1.0560+00	1.0710+00
1.0882+00	1.1075+00	1.1269+00	1.1519+00	1.1759+00	1.2004+00	1.2247+00	1.2482+00	1.2705+00	1.2912+00
1.3101+00	1.3275+00	1.3435+00	1.3585+00	1.3730+00	1.3877+00	1.4029+00	1.4190+00	1.4363+00	1.4547+00
1.4742+00	1.4942+00	1.5142+00	1.5337+00						

SPAN STATION 1 CHORD STATION 2

6.0800-01	6.1991-01	6.3056-01	6.3944-01	6.4622-01	6.5077-01	6.5317-01	6.5369-01	6.5274-01	6.5088-01
6.4870-01	6.4678-01	6.4562-01	6.4562-01	6.4701-01	6.4986-01	6.5403-01	6.5927-01	6.6517-01	6.7128-01
6.7712-01	6.8222-01	6.8621-01	6.8881-01	6.8988-01	6.8940-01	6.8749-01	6.8435-01	6.8025-01	6.7547-01
6.7031-01	6.6498-01	6.5965-01	6.5438-01	6.4914-01	6.4382-01	6.3825-01	6.3222-01	6.2553-01	6.1799-01
6.0948-01	5.9994-01	5.8938-01	5.7793-01	5.6576-01	5.5311-01	5.4024-01	5.2743-01	5.1495-01	5.0303-01
4.9186-01	4.8159-01	4.7232-01	4.6412-01	4.5706-01	4.5119-01	4.4658-01	4.4330-01	4.4148-01	4.4123-01
4.4269-01	4.4598-01	4.5115-01	4.5820-01	4.6706-01	4.7752-01	4.8925-01	5.0184-01	5.1475-01	5.2739-01
5.3912-01	5.4934-01	5.5747-01	5.6306-01	5.6579-01	5.6550-01	5.6220-01	5.5608-01	5.4748-01	5.3635-01
5.2474-01	5.1173-01	4.9835-01	4.8512-01	4.7244-01	4.6060-01	4.4977-01	4.4000-01	4.3124-01	4.2340-01
4.1632-01	4.0986-01	4.0390-01	3.9840-01	3.9336-01	3.8887-01	3.8506-01	3.8211-01	3.8018-01	3.7941-01
3.7989-01	3.8159-01	3.8441-01	3.8812-01	3.9241-01	3.9692-01	4.0122-01	4.0494-01	4.0775-01	4.0943-01
4.0990-01	4.0924-01	4.0767-01	4.0558-01	4.0347-01	4.0188-01	4.0138-01	4.0248-01	4.0559-01	4.1093-01
4.1857-01	4.2836-01	4.3995-01	4.5283-01	4.6636-01	4.7986-01	4.9265-01	5.0412-01	5.1382-01	5.2147-01
5.2702-01	5.3061-01	5.3263-01	5.3359-01	5.3413-01	5.3492-01	5.3661-01	5.3972-01	5.4465-01	5.5158-01
5.6046-01	5.7105-01	5.8290-01	5.9544-01						

SPAN STATION 1 CHORD STATION 3

3.4065-01	3.4701-01	3.5261-01	3.5736-01	3.6125-01	3.6439-01	3.6692-01	3.6909-01	3.7113-01	3.7329-01
3.7578-01	3.7876-01	3.8229-01	3.8635-01	3.9082-01	3.9552-01	4.0019-01	4.0455-01	4.0830-01	4.1117-01
4.1295-01	4.1350-01	4.1274-01	4.1071-01	4.0751-01	4.0331-01	3.9831-01	3.9276-01	3.8686-01	3.8079-01
3.7471-01	3.6866-01	3.6267-01	3.5669-01	3.5052-01	3.4434-01	3.3774-01	3.3072-01	3.2323-01	3.1526-01
3.0688-01	2.9820-01	2.8940-01	2.8068-01	2.7226-01	2.6435-01	2.5713-01	2.5072-01	2.4519-01	2.4054-01
2.3670-01	2.3357-01	2.3099-01	2.2883-01	2.2695-01	2.2525-01	2.2372-01	2.2238-01	2.2135-01	2.2080-01
2.2093-01	2.2200-01	2.2421-01	2.2774-01	2.3270-01	2.3910-01	2.4682-01	2.5563-01	2.6520-01	2.7509-01
2.8480-01	2.9379-01	3.0155-01	3.0759-01	3.1153-01	3.1310-01	3.1216-01	3.0871-01	3.0291-01	2.9503-01
2.8542-01	2.7453-01	2.6282-01	2.5076-01	2.3878-01	2.2725-01	2.1645-01	2.0660-01	1.9780-01	1.9011-01
1.8350-01	1.7791-01	1.7325-01	1.6942-01	1.6635-01	1.6396-01	1.6221-01	1.6105-01	1.6047-01	1.6046-01
1.6099-01	1.6203-01	1.6361-01	1.6535-01	1.6745-01	1.6965-01	1.7198-01	1.7420-01	1.7628-01	1.7821-01
1.7999-01	1.8169-01	1.8343-01	1.8537-01	1.8767-01	1.9051-01	1.9404-01	1.9837-01	2.0356-01	2.0959-01
2.1635-01	2.2368-01	2.3135-01	2.3910-01	2.4663-01	2.5369-01	2.6005-01	2.6554-01	2.7009-01	2.7373-01
2.7655-01	2.7875-01	2.8060-01	2.8238-01	2.8440-01	2.8693-01	2.9019-01	2.9432-01	2.9936-01	3.0527-01
3.1190-01	3.1903-01	3.2639-01	3.3369-01						

SPAN STATION 1 CHORD STATION 4

Figure 50. Continued.

0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000
0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000
0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000
0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000
0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000
0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000
0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000
0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000
0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000
0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000
0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000
0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000
0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000
0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000
0.0000	0.0000	0.0000	0.0000						

SPAN STATION 1 CHORD STATION 5

-6.8609-02	-6.8922-02	-6.9122-02	-6.9227-02	-6.9267-02	-6.9277-02	-6.9298-02	-6.9367-02	-6.9515-02	-6.9760-02
-7.0106-02	-7.0542-02	-7.1037-02	-7.1549-02	-7.2026-02	-7.2408-02	-7.2639-02	-7.2668-02	-7.2455-02	-7.1978-02
-7.1232-02	-7.0231-02	-6.9008-02	-6.7608-02	-6.6089-02	-6.4511-02	-6.2933-02	-6.1407-02	-5.9974-02	-5.8658-02
-5.7470-02	-5.6[illegible]05-02	-5.5445-02	-5.4562-02	-5.3724-02	-5.2900-02	-5.2065-02	-5.1203-02	-5.0309-02	-4.9391-02
-4.8470-02	-4.[illegible]575-02	-4.6741-02	-4.6006-02	-4.5402-02	-4.4953-02	-4.4670-02	-4.4553-02	-4.4586-02	-4.4737-02
-4.4969-02	-4.5234-02	-4.5487-02	-4.5686-02	-4.5798-02	-4.5807-02	-4.5709-02	-4.5521-02	-4.5274-02	-4.5814-02
-4.4794-02	-4.4671-02	-4.4699-02	-4.4925-02	-4.5380-02	-4.6081-02	-4.7023-02	-4.8183-02	-4.9521-02	-5.0983-02
-5.2503-02	-5.4015-02	-5.5450-02	-5.6748-02	-5.7859-02	-5.8744-02	-5.9383-02	-5.9765-02	-5.9897-02	-5.9792-02
-5.9475-02	-5.8970-02	-5.8306-02	-5.7510-02	-5.6604-02	-5.5610-02	-5.4546-02	-5.3428-02	-5.2274-02	-5.1105-02
-4.9944-02	-4.8823-02	-4.7774-02	-4.6837-02	-4.6052-02	-4.5458-02	-4.5089-02	-4.4971-02	-4.5117-02	-4.5526-02
-4.6180-02	-4.7047-02	-4.8078-02	-4.9216-02	-5.0394-02	-5.1546-02	-5.2609-02	-5.3532-02	-5.4276-02	-5.4819-02
-5.5160-02	-5.5315-02	-5.5317-02	-5.5214-02	-5.5056-02	-5.4902-02	-5.4801-02	-5.4798-02	-5.4922-02	-5.5189-02
-5.5598-02	-5.6131-02	-5.6702-02	-5.7453-02	-5.8165-02	-5.8860-02	-5.9506-02	-6.0081-02	-6.0574-02	-6.0990-02
-6.1342-02	-6.1654-02	-6.1956-02	-6.2279-02	-6.2652-02	-6.3098-02	-6.3616-02	-6.4218-02	-6.4884-02	-6.5593-02
-6.6311-02	-6.7003-02	-6.7635-02	-6.8177-02						

SPAN STATION 2 CHORD STATION 1

4.0919+00	4.1629+00	4.2324+00	4.2991+00	4.3615+00	4.4185+00	4.4691+00	4.5126+00	4.5486+00	4.5770+00
4.5980+00	4.6119+00	4.6195+00	4.6215+00	4.6189+00	4.6124+00	4.6029+00	4.5911+00	4.5775+00	4.5625+00
4.5462+00	4.5286+00	4.5098+00	4.4895+00	4.4677+00	4.4442+00	4.4192+00	4.3928+00	4.3654+00	4.3373+00
4.3091+00	4.2816+00	4.2551+00	4.2303+00	4.2075+00	4.1868+00	4.1681+00	4.1510+00	4.1348[illegible]	4.1185+00
4.1010+00	4.0809+00	4.0571+00	4.0281+00	3.9930+00	3.9511+00	3.9018+00	3.8453+00	3.781[illegible]	3.7124+00
3.6382+00	3.5607+00	3.4817+00	3.4032+00	3.3270+00	3.2550+00	3.1886+00	3.129[illegible]	3.[illegible]	3.0346+00
3.0001+00	2.9739+00	2.9554+00	2.9437+00	2.9376+00	2.9359+00	2.9372+00	2.9403+[illegible]	2.[illegible]38+00	2.9467+00
2.9479+00	2.9468+00	2.9427+00	2.9354+00	2.9247+00	2.9106+00	2.8935+00	2.8738+00	2.8519+00	2.8286+00
2.8045+00	2.7806+00	2.7575+00	2.7361+00	2.7172+00	2.7015+00	2.6896+00	2.6819+00	2.6787+00	2.6802+00
2.6862+00	2.6966+00	2.7109+00	2.7234+00	2.7486+00	2.7705+00	2.7934+00	2.8164+00	2.8388+00	2.8599+00
2.8793+00	2.8966+00	2.9117+00	2.9245+00	2.9353+00	2.9445+00	2.9524+00	2.9597+00	2.9670+00	2.9747+00
2.9834+00	2.9935+00	3.0054+00	3.0194+00	3.0354+00	3.0536+00	3.0737+00	3.0956+00	3.1189+00	3.1434+00
3.1686+00	3.1942+00	3.2200+00	3.2455+00	3.2706+00	3.2953+00	3.3194+00	3.3432+00	3.3668+00	3.3906+00
3.4150+00	3.4406+00	3.4660+00	3.4978+00	3.5307+00	3.5674+00	3.6083+00	3.6539+00	3.7043+00	3.7596+00
3.8195+00	3.8635+00	3.9510+00	4.0208+00						

SPAN STATION 2 CHORD STATION 2

1.7023+00	1.7303+00	1.7691+00	1.7998+00	1.8275+00	1.8514+00	1.8711+00	1.8861+00	1.8965+00	1.9024+00
1.9042+00	1.9024+00	1.8978+00	1.8908+00	1.8823+00	1.8728+00	1.8629+00	1.8528+00	1.8428+00	1.8330+00
1.8233+00	1.8135+00	1.8036+00	1.7932+00	1.7824+00	1.7709+00	1.7589+00	1.7463+00	1.7333+00	1.7203+00

Figure 50. Continued.

1.7075+00	1.6952+00	1.6835+00	1.6728+00	1.6630+00	1.6541+00	1.6459+00	1.6381+00	1.6302+00	1.6218+00
1.6124+00	1.6013+00	1.5881+00	1.5724+00	1.5539+00	1.5326+00	1.5084+00	1.4816+00	1.4525+00	1.4216+00
1.3896+00	1.3571+00	1.3248+00	1.2936+00	1.2640+00	1.2367+00	1.2123+00	1.1912+00	1.1736+00	1.1398+00
1.1497+00	1.1433+00	1.1403+00	1.1402+00	1.1427+00	1.1471+00	1.1528+00	1.1591+00	1.1652+00	1.1706+00
1.1746+00	1.1767+00	1.1764+00	1.1736+00	1.1680+00	1.1598+00	1.1493+00	1.1368+00	1.1230+00	1.1085+00
1.0941+00	1.0805+00	1.0684+00	1.0584+00	1.0511+00	1.0467+00	1.0454+00	1.0472+00	1.0517+00	1.0587+00
1.0676+00	1.0779+00	1.0889+00	1.1000+00	1.1107+00	1.1207+00	1.1295+00	1.1370+00	1.1433+00	1.1485+00
1.1526+00	1.1561+00	1.1591+00	1.1621+00	1.1653+00	1.1688+00	1.1729+00	1.1776+00	1.1829+00	1.1888+00
1.1953+00	1.2022+00	1.2095+00	1.2172+00	1.2252+00	1.2336+00	1.2425+00	1.2520+00	1.2622+00	1.2730+00
1.2847+00	1.2970+00	1.3100+00	1.3235+00	1.3372+00	1.3509+00	1.3643+00	1.3773+00	1.3896+00	1.4013+00
1.4124+00	1.4230+00	1.4336+00	1.4445+00	1.4564+00	1.4696+00	1.4849+00	1.5027+00	1.5233+00	1.5469+00
1.5736+00	1.6030+00	1.6348+00	1.6681+00						

SPAN STATION 2 CHORD STATION 3

1.2460+00	1.2626+00	1.2783+00	1.2929+00	1.3060+00	1.3176+00	1.3277+00	1.3361+00	1.3432+00	1.3488+00
1.3531+00	1.3564+00	1.3586+00	1.3599+00	1.3604+00	1.3601+00	1.3592+00	1.3576+00	1.3555+00	1.3528+00
1.3497+00	1.3461+00	1.3422+00	1.3381+00	1.3338+00	1.3294+00	1.3250+00	1.3207+00	1.3166+00	1.3126+00
1.3088+00	1.3051+00	1.3016+00	1.2982+00	1.2948+00	1.2912+00	1.2876+00	1.2837+00	1.2794+00	1.2746+00
1.2692+00	1.2630+00	1.2560+00	1.2479+00	1.2386+00	1.2281+00	1.2162+00	1.2029+00	1.1882+00	1.1720+00
1.1546+00	1.1361+00	1.1169+00	1.0973+00	1.0777+00	1.0585+00	1.0403+00	1.0235+00	1.0085+00	9.9579-01
9.8551-01	9.7785-01	9.7281-01	9.7029-01	9.7003-01	9.7168-01	9.7479-01	9.7884-01	9.8331-01	9.8766-01
9.9142-01	9.9420-01	9.9568-01	9.9568-01	9.9412-01	9.9107-01	9.8666-01	9.8113-01	9.7477-01	9.6792-01
9.6092-01	9.5406-01	9.4770-01	9.4201-01	9.3720-01	9.3341-01	9.3070-01	9.2913-01	9.2868-01	9.2933-01
9.3105-01	9.3379-01	9.3748-01	9.4207-01	9.4748-01	9.5363-01	9.6040-01	9.6767-01	9.7527-01	9.8302-01
9.9071-01	9.9813-01	1.0050+00	1.0113+00	1.0167+00	1.0211+00	1.0246+00	1.0271+00	1.0287+00	1.0297+00
1.0302+00	1.0306+00	1.0311+00	1.0320+00	1.0335+00	1.0359+00	1.0392+00	1.0435+00	1.0486+00	1.0544+00
1.0607+00	1.0672+00	1.0736+00	1.0795+00	1.0848+00	1.0893+00	1.0929+00	1.0957+00	1.0977+00	1.0993+00
1.1007+00	1.1023+00	1.1045+00	1.1078+00	1.1125+00	1.1188+00	1.1270+00	1.1371+00	1.1492+00	1.1629+00
1.1781+00	1.1945+00	1.2115+00	1.2288+00						

SPAN STATION 2 CHORD STATION 4

3.6195-01	3.7215-01	3.8232-01	3.9209-01	4.0105-01	4.0883-01	4.1510-01	4.1960-01	4.2218-01	4.2277-01
4.2144-01	4.1836-01	4.1380-01	4.0810-01	4.0166-01	3.9489-01	3.8817-01	3.8187-01	3.7626-01	3.7154-01
3.6779-01	3.6501-01	3.6310-01	3.6189-01	3.6115-01	3.6064-01	3.6010-01	3.5931-01	3.5809-01	3.5633-01
3.5398-01	3.5102-01	3.4754-01	3.4362-01	3.3937-01	3.3492-01	3.3034-01	3.2572-01	3.2105-01	3.1631-01
3.1143-01	3.0630-01	3.0081-01	2.9484-01	2.8832-01	2.8119-01	2.7348-01	2.6525-01	2.5666-01	2.4791-01
2.3926-01	2.3099-01	2.2338-01	2.1691-01	2.1121-01	2.0702-01	2.0424-01	2.0287-01	2.0280-01	2.0389-01
2.0590-01	2.0854-01	2.1153-01	2.1456-01	2.1736-01	2.1970-01	2.2140-01	2.2235-01	2.2251-01	2.2187-01
2.2052-01	2.1855-01	2.1607-01	2.1324-01	2.1016-01	2.0697-01	2.0375-01	2.0058-01	1.9752-01	1.9462-01
1.9191-01	1.6944-01	1.8725-01	1.8540-01	1.8397-01	1.8304-01	1.8268-01	1.8298-01	1.8400-01	1.8577-01
1.8829-01	1.9153-01	1.9540-01	1.9978-01	2.0449-01	2.0935-01	2.1416-01	2.1872-01	2.2285-01	2.2640-01
2.2927-01	2.3143-01	2.3288-01	2.3369-01	2.3399-01	2.3393-01	2.3369-01	2.3346-01	2.3342-01	2.3373-01
2.3452-01	2.3586-01	2.3779-01	2.4032-01	2.4339-01	2.4693-01	2.5084-01	2.5499-01	2.5929-01	2.6362-01
2.6788-01	2.7198-01	2.7587-01	2.7948-01	2.8281-01	2.8581-01	2.8849-01	2.9086-01	2.9294-01	2.9476-01
2.9638-01	2.9787-01	2.9933-01	3.0087-01	3.0265-01	3.0482-01	3.0755-01	3.1100-01	3.1532-01	3.2063-01
3.2699-01	3.3441-01	3.4282-01	3.5207-01						

SPAN STATION 2 CHORD STATION 5

-1.3397-01	-1.3329-01	-1.3267-01	-1.5222-01	-1.3203-01	-1.3220-01	-1.3279-01	-1.3385-01	-1.3538-01	-1.3735-01
-1.3969-01	-1.4231-01	-1.4509-01	-1.4791-01	-1.5063-01	-1.5314-01	-1.5535-01	-1.5720-01	-1.5865-01	-1.5972-01
-1.6045-01	-1.6090-01	-1.6116-01	-1.6134-01	-1.6151-01	-1.6176-01	-1.6216-01	-1.6274-01	-1.6351-01	-1.6437-01
-1.6556-01	-1.6675-01	-1.6799-01	-1.6922-01	-1.7041-01	-1.7154-01	-1.7263-01	-1.7370-01	-1.7481-01	-1.7604-01
-1.7745-01	-1.7912-01	-1.8111-01	-1.8346-01	-1.8615-01	-1.8917-01	-1.9242-01	-1.9580-01	-1.9917-01	-2.0238-01
-2.0525-01	-2.0763-01	-2.0940-01	-2.1044-01	-2.1069-01	-2.1016-01	-2.0887-01	-2.0691-01	-2.0440-01	-2.0149-01
-1.9834-01	-1.9513-01	-1.9202-01	-1.8913-01	-1.8657-01	-1.8441-01	-1.8268-01	-1.8137-01	-1.8046-01	-1.7987-01
-1.7955-01	-1.7941-01	-1.7938-01	-1.7939-01	-1.7940-01	-1.7937-01	-1.7929-01	-1.7915-01	-1.7897-01	-1.7873-01

Figure 50. Continued.

-1.7866-01	-1.7815-01	-1.7779-01	-1.7737-01	-1.7685-01	-1.7621-01	-1.7540-01	-1.7441-01	-1.7320-01	-1.7177-01
-1.7015-01	-1.6835-01	-1.6644-01	-1.6448-01	-1.6256-01	-1.6075-01	-1.5914-01	-1.5779-01	-1.5676-01	-1.5608-01
-1.5574-01	-1.5572-01	-1.5598-01	-1.5644-01	-1.5701-01	-1.5760-01	-1.5812-01	-1.5849-01	-1.5864-01	-1.5852-01
-1.5811-01	-1.5740-01	-1.5640-01	-1.5515-01	-1.5369-01	-1.5208-01	-1.5035-01	-1.4858-01	-1.4678-01	-1.4501-01
-1.4329-01	-1.4164-01	-1.4008-01	-1.3861-01	-1.3725-01	-1.3603-01	-1.3494-01	-1.3402-01	-1.3328-01	-1.3275-01
-1.3243-01	-1.3232-01	-1.3243-01	-1.3272-01	-1.3315-01	-1.3368-01	-1.3425-01	-1.3479-01	-1.3522-01	-1.3551-01
-1.3560-01	-1.3547-01	-1.3513-01	-1.3461-01						

SPAN STATION 3 CHORD STATION 1

5.3763+00	5.4621+00	5.5329+00	5.5895+00	5.6342+00	5.6704+00	5.7020+00	5.7329+00	5.7661+00	5.8034+00
5.8451+00	5.8903+00	5.9363+00	5.9796+00	6.0160+00	6.0414+00	6.0522+00	6.0459+00	6.0213+00	5.9788+00
5.9205+00	5.8499+00	5.7713+00	5.6899+00	5.6105+00	5.5377+00	5.4748+00	5.4240+00	5.3857+00	5.3588+00
5.3409+00	5.3285+00	5.3175+00	5.3037+00	5.2834+00	5.2534+00	5.2119+00	5.1584+00	5.0935+00	5.0190+00
4.9374+00	4.8519+00	4.7656+00	4.6811+00	4.6008+00	4.5258+00	4.4565+00	4.3924+00	4.3325+00	4.2752+00
4.2191+00	4.1631+00	4.1066+00	4.0499+00	3.9942+00	3.9414+00	3.8941+00	3.8548+00	3.8262+00	3.8102+00
3.8078+00	3.8189+00	3.8418+00	3.8737+00	3.9104+00	3.9472+00	3.9790+00	4.0008+00	4.0086+00	3.9995+00
3.9724+00	3.9277+00	3.8679+00	3.7971+00	3.7203+00	3.6436+00	3.5727+00	3.5130+00	3.4687+00	3.4422+00
3.4342+00	3.4436+00	3.4674+00	3.5013+00	3.5403+00	3.5792+00	3.6133+00	3.6390+00	3.6540+00	3.6582+00
3.6525+00	3.6411+00	3.6273+00	3.6161+00	3.6123+00	3.6199+00	3.6415+00	3.6779+00	3.7280+00	3.7883+00
3.8539+00	3.9185+00	3.9754+00	4.0103+00	4.0417+00	4.0423+00	4.0191+00	3.9739+00	3.9113+00	3.8382+00
3.7635+00	3.6971+00	3.6469+00	3.6280+00	3.6414+00	3.6932+00	3.7845+00	3.9125+00	4.0714+00	4.2521+00
4.4435+00	4.6335+00	4.8097+00	4.9610+00	5.0785+00	5.1563+00	5.1917+00	5.1863+00	5.1446+00	5.0745+00
4.9858+00	4.8898+00	4.7977+00	4.7198+00	4.6646+00	4.6380+00	4.6430+00	4.6795+00	4.7445+00	4.8329+00
4.9378+00	5.0516+00	5.1668+00	5.2768+00						

SPAN STATION 3 CHORD STATION 2

8.6523-01	8.8535-01	9.0299-01	9.1806-01	9.3064-01	9.4094-01	9.4921-01	9.5575-01	9.6077-01	9.6441-01
9.6666-01	9.6739-01	9.6633-01	9.6315-01	9.5745-01	9.4887-01	9.3712-01	9.2206-01	9.0373-01	8.8230-01
8.5847-01	8.3266-01	8.0574-01	7.7863-01	7.5223-01	7.2741-01	7.0489-01	6.8520-01	6.6864-01	6.5521-01
6.4467-01	6.3650-01	6.2999-01	6.2427-01	6.1842-01	6.1147-01	6.0257-01	5.9098-01	5.7616-01	5.5779-01
5.3578-01	5.1026-01	4.8161-01	4.5056-01	4.1718-01	3.8285-01	3.4820-01	3.1404-01	2.8118-01	2.5037-01
2.2228-01	1.9750-01	1.7652-01	1.5971-01	1.4736-01	1.3963-01	1.3655-01	1.3805-01	1.4390-01	1.5373-01
1.6707-01	1.8329-01	2.0165-01	2.2131-01	2.4141-01	2.6103-01	2.7933-01	2.9551-01	3.0892-01	3.1909-01
3.2573-01	3.2877-01	3.2837-0.	3.2486-01	3.1877-01	3.1073-01	3.0145-01	2.9165-01	2.8201-01	2.7313-01
2.6548-01	2.5940-01	2.5508-01	2.5256-01	2.5180-01	2.5264-01	2.5492-01	2.5845-01	2.6308-01	2.6870-01
2.7525-01	2.8275-01	2.9124-01	3.0077-01	3.1137-01	3.2300-01	3.3557-01	3.4884-01	3.6251-01	3.7615-01
3.8926-01	4.0135-01	4.1191-01	4.2052-01	4.2692-01	4.3101-01	4.3289-01	4.3291-01	4.3161-01	4.2970-01
4.2801-01	4.2744-01	4.2882-01	4.3298-01	4.4013-01	4.5086-01	4.6503-01	4.8234-01	5.0217-01	5.2369-01
5.4591-01	5.6776-01	5.8821-01	6.0636-01	6.2153-01	6.3331-01	6.4161-01	6.4670-01	6.4913-01	6.4972-01
6.4946-01	6.4943-01	6.5070-01	6.5421-01	6.6071-01	6.7068-01	6.8431-01	7.0146-01	7.2174-01	7.4447-01
7.6886-01	7.9399-01	8.1895-01	8.4293-01						

SPAN STATION 3 CHORD STATION 3

-2.4782-01	-2.3806-01	-2.2862-01	-2.1957-01	-2.1099-01	-2.0300-01	-1.9579-01	-1.8960-01	-1.8469-01	-1.8135-01
-1.7985-01	-1.8043-01	-1.8324-01	-1.8833-01	-1.9566-01	-2.0504-01	-2.1618-01	-2.2867-01	-2.4206-01	-2.5582-01
-2.6946-01	-2.8251-01	-2.9456-01	-3.0533-01	-3.1466-01	-3.2251-01	-3.2900-01	-3.3432-01	-3.3878-01	-3.4276-01
-3.4664-01	-3.5080-01	-3.5560-01	-3.6132-01	-3.6817-01	-3.7627-01	-3.8564-01	-3.9624-01	-4.0795-01	-4.2060-01
-4.3397-01	-4.4784-01	-4.6196-01	-4.7608-01	-4.8995-01	-5.0333-01	-5.1595-01	-5.2758-01	-5.3796-01	-5.4683-01
-5.5394-01	-5.5904-01	-5.6193-01	-5.6243-01	-5.6044-01	-5.5591-01	-5.4891-01	-5.3958-01	-5.2818-01	-5.1503-01
-5.0055-01	-4.8521-01	-4.6949-01	-4.5387-01	-4.3882-01	-4.2470-01	-4.1181-01	-4.0037-01	-3.9048-01	-3.8213-01
-3.7527-01	-3.6976-01	-3.6543-01	-3.6213-01	-3.5971-01	-3.5804-01	-3.5708-01	-3.5681-01	-3.5727-01	-3.5851-01
-3.6060-01	-3.6361-01	-3.6754-01	-3.7234-01	-3.7790-01	-3.8401-01	-3.9041-01	-3.9678-01	-4.0277-01	-4.0805-01
-4.1231-01	-4.1535-01	-4.1706-01	-4.1744-01	-4.1665-01	-4.1495-01	-4.1270-01	-4.1035-01	-4.0832-01	-4.0706-01
-4.0691-01	-4.0808-01	-4.1065-01	-4.1452-01	-4.1942-01	-4.2494-01	-4.3051-01	-4.3555-01	-4.3940-01	-4.4151-01
-4.4138-01	-4.3872-01	-4.3338-01	-4.2546-01	-4.1526-01	-4.0325-01	-3.9008-01	-3.7646-01	-3.6317-01	-3.5094-01
-3.4038-01	-3.3199-01	-3.2607-01	-3.2269-01	-3.2174-01	-3.2291-01	-3.2571-01	-3.2958-01	-3.3387-01	-3.3794-01

Figure 50. Continued.

-3.4121-01	-3.4320-01	-3.4355-01	-3.4207-01	-3.3869-01	-3.3350-01	-3.2669-01	-3.1854-01	-3.0935-01	-2.9944-01
-2.8912-01	-2.7864-01	-2.6818-01	-2.5788-01						

SPAN STATION 3 CHORD STATION 4

1.1841+00	1.1801+00	1.1889+00	1.1924+00	1.1965+00	1.2008+00	1.2050+00	1.2088+00	1.2116+00	1.2132+00
1.2135+00	1.2122+00	1.2094+00	1.2052+00	1.1999+00	1.1938+00	1.1873+00	1.1808+00	1.1746+00	1.1691+00
1.1645+00	1.1608+00	1.1582+00	1.1564+00	1.1554+00	1.1550+00	1.1549+00	1.1549+00	1.1548+00	1.1545+00
1.1538+00	1.1527+00	1.1512+00	1.1494+00	1.1471+00	1.1446+00	1.1417+00	1.1386+00	1.1351+00	1.1313+00
1.1270+00	1.1223+00	1.1172+00	1.1116+00	1.1057+00	1.0997+00	1.0938+00	1.0883+00	1.0835+00	1.0797+00
1.0773+00	1.0764+00	1.0773+00	1.0801+00	1.0845+00	1.0906+00	1.0979+00	1.1061+00	1.1149+00	1.1238+00
1.1324+00	1.1405+00	1.1478+00	1.1544+00	1.1602+00	1.1653+00	1.1702+00	1.1749+00	1.1799+00	1.1854+00
1.1914+00	1.1982+00	1.2056+00	1.2134+00	1.2212+00	1.2286+00	1.2352+00	1.2405+00	1.2441+00	1.2457+00
1.2451+00	1.2424+00	1.2378+00	1.2317+00	1.2245+00	1.2170+00	1.2096+00	1.2031+00	1.1979+00	1.1945+00
1.1929+00	1.1932+00	1.1951+00	1.1983+00	1.2023+00	1.2065+00	1.2102+00	1.2131+00	1.2146+00	1.2145+00
1.2129+00	1.2098+00	1.2056+00	1.2008+00	1.1959+00	1.1917+00	1.1885+00	1.1868+00	1.1870+00	1.1891+00
1.1930+00	1.1983+00	1.2046+00	1.2112+00	1.2174+00	1.2226+00	1.2263+00	1.2279+00	1.2272+00	1.2241+00
1.2189+00	1.2119+00	1.2037+00	1.1947+00	1.1858+00	1.1776+00	1.1705+00	1.1650+00	1.1614+00	1.1597+00
1.1597+00	1.1613+00	1.1640+00	1.1673+00	1.1709+00	1.1743+00	1.1772+00	1.1794+00	1.1309+00	1.1817+00
1.1821+00	1.1822+00	1.1824+00	1.1829+00						

SPAN STATION 3 CHORD STATION 5

2.1612-01	2.0958-01	2.0955-01	2.1001-01	2.1087-01	2.1195-01	2.1304-01	2.1393-01	2.1440-01	2.1427-01
2.1344-01	2.1184-01	2.0953-01	2.0660-01	2.0323-01	1.9963-01	1.9601-01	1.9261-01	1.8961-01	1.8717-01
1.8535-01	1.8419-01	1.8365-01	1.8362-01	1.8398-01	1.8458-01	1.8525-01	1.8587-01	1.8631-01	1.8450-01
1.8641-01	1.8604-01	1.8540-01	1.8496-01	1.8355-01	1.8242-01	1.8120-01	1.7991-01	1.7854-01	1.7786-01
1.7547-01	1.7372-01	1.7183-01	1.6982-01	1.6773-01	1.6567-01	1.6375-01	1.6212-01	1.6092-01	1.6031-01
1.6040-01	1.6125-01	1.6289-01	1.6527-01	1.6826-01	1.7169-01	1.7534-01	1.7897-01	1.8235-01	1.8528-01
1.8759-01	1.8921-01	1.9016-01	1.9052-01	1.9047-01	1.9025-01	1.9013-01	1.9040-01	1.9131-01	1.9304-01
1.9569-01	1.9928-01	2.0369-01	2.0869-01	2.1400-01	2.1926-01	2.2407-01	2.2809-01	2.3102-01	2.3263-01
2.3284-01	2.3167-01	2.2931-01	2.2603-01	2.2220-01	2.1823-01	2.1456-01	2.1158-01	2.0958-01	2.0878-01
2.0924-01	2.1089-01	2.1354-01	2.1688-01	2.2053-01	2.2409-01	2.2717-01	2.2944-01	2.3066-01	2.3074-01
2.2970-01	2.2770-01	2.2500-01	2.2197-01	2.1899-01	2.1647-01	2.1473-01	2.1403-01	2.1449-01	2.1611-01
2.1874-01	2.2211-01	2.2584-01	2.2951-01	2.3269-01	2.3496-01	2.3601-01	2.3563-01	2.3374-01	2.3083-01
2.2590-01	2.2050-01	2.1465-01	2.0880-01	2.0340-01	1.9887-01	1.9552-01	1.9354-01	1.9301-01	1.9385-01
1.9588-01	1.9879-01	2.0225-01	2.0587-01	2.0930-01	2.1222-01	2.1443-01	2.1578-01	2.1628-01	2.1600-01
2.1511-01	2.1383-01	2.1242-01	2.1112-01						

SPAN STATION 4 CHORD STATION 1

6.8097+00	6.7317+00	6.6777+00	6.6518+00	6.6572+00	6.6947+00	6.7634+00	6.8597+00	6.9781+00	7.1114+00
7.2513+00	7.3892+00	7.5171+00	7.6282+00	7.7175+00	7.7826+00	7.8233+00	7.8420+00	7.8432+00	7.8329-00
7.8181+00	7.8059+00	7.8029+00	7.8144+00	7.8443+00	7.8947+00	7.9657+00	8.0559+00	8.1627+00	8.2829+00
8.4129+00	8.5495+00	8.6904+00	8.8341+00	8.9802+00	9.1293+00	9.2826+00	9.4415+00	9.6069+00	9.7794+00
9.9579+00	1.0140+01	1.0323+01	1.9500+01	1.0665+01	1.0813+01	1.0937+01	1.1030+01	1.1090+01	1.1113+01
1.1101+01	1.1055+01	1.0982+01	1.0888+01	1.0782+01	1.0672+01	1.0568+01	1.0476+01	1.0403+01	1.0352+01
1.0324+01	1.0317+01	1.0328+01	1.0350+01	1.0378+01	1.0405+01	1.0424+01	1.0430+01	1.0420+01	1.0394+01
1.0352+01	1.0297+01	1.0234+01	1.0169+01	1.0107+01	1.0054+01	1.0013+01	9.9886+00	9.9801+00	9.9867+00
1.0006+01	1.0032+01	1.0063+01	1.0092+01	1.0116+01	1.0231+01	1.0137+01	1.0134+01	1.0125+01	1.0114+01
1.0105+01	1.0103+01	1.0114+01	1.0141+01	1.0185+01	1.0248+01	1.0328+01	1.0419+01	1.0518+01	1.0616+01
1.0708+01	1.0787+01	1.0849+01	1.0889+01	1.0909+01	1.0908+01	1.0893+01	1.0868+01	1.0840+01	1.0818+01
1.0809+01	1.0817+01	1.0846+01	1.0896+01	1.0966+01	1.1049+01	1.1137+01	1.1221+01	1.1290+01	1.1332+01
1.1339+01	1.1303+01	1.1219+01	1.1085+01	1.0903+01	1.0679+01	1.0420+01	1.0136+01	9.8365+00	9.5329+00
9.2349+00	8.9505+00	8.6854+00	8.4431+00	8.2244+00	8.0281+00	7.8514+00	7.6905+00	7.5414+00	7.4810+00
7.2669+00	7.1388+00	7.0178+00	6.9067+00						

SPAN STATION 4 CHORD STATION 2

Figure 50. Continued.

2.2403+06	2.2222+00	2.2074+00	2.1970+00	2.1923+00	2.1942+00	2.2035+00	2.2202+00	2.2439+00	2.2736+00
2.3081+00	2.3458+00	2.3851+00	2.4242+00	2.4619+00	2.4971+00	2.5289+00	2.5569+00	2.5811+00	2.6014+00
2.6183+00	2.6324+00	2.6441+00	2.6546+00	2.6650+00	2.6767+00	2.6916+00	2.7119+00	2.7404+00	2.7800+00
2.8338+00	2.9050+00	2.9961+00	3.1092+00	3.2454+00	3.4041+00	3.5836+00	3.7801+00	3.9885+00	4.2021+00
4.4130+00	4.6130+00	4.7938+00	4.9476+00	5.0684+00	5.1517+00	5.1959+00	5.2015+00	5.1723+00	5.1142+00
5.0354+00	4.9451+00	4.8536+00	4.7705+00	4.7045+00	4.6621+00	4.6476+00	4.6620+00	4.7037+00	4.7680+00
4.8481+00	4.9354+00	5.0205+00	5.0944+00	5.1487+00	5.1772+00	5.1759+00	5.1436+00	5.0818+00	4.9949+00
4.8890+00	4.7719+00	4.6518+00	4.5370+00	4.4345+00	4.3497+00	4.2860+00	4.2445+00	4.2238+00	4.2210+00
4.2314+00	4.2496+00	4.2702+00	4.2884+00	4.3006+00	4.3047+00	4.3004+00	4.2892+00	4.2740+00	4.2587+00
4.2477+00	4.2450+00	4.2539+00	4.2763+00	4.3123+00	4.3604+00	4.4171+00	4.4777+00	4.5364+00	4.5875+00
4.6255+00	4.6461+00	4.6468+00	4.6270+00	4.5887+00	4.5357+00	4.4740+00	4.4105+00	4.3529+00	4.3085+00
4.2836+00	4.2826+00	4.3075+00	4.3579+00	4.4302+00	4.5187+00	4.6154+00	4.7108+00	4.7952+00	4.8588+00
4.8932+00	4.8918+00	4.8506+00	4.7681+00	4.6460+00	4.4884+00	4.3017+00	4.0939+00	3.8742+00	3.6515+00
3.4344+00	3.2305+00	3.0453+00	2.8827+00	2.7444+00	2.6305+00	2.5392+00	2.4678+00	2.4125+00	2.3696+00
2.3356+00	2.3074+00	2.2829+00	2.2606+00						

SPAN STATION 4 CHORD STATION 3

1.2172+00	1.1939+00	1.1736+00	1.1580+00	1.1487+00	1.1468+00	1.1527+00	1.1661+00	1.1858+00	1.2103+00
1.2373+00	1.2646+00	1.2897+00	1.3109+00	1.3267+00	1.3365+00	1.3405+00	1.3395+00	1.3351+00	1.3294+00
1.3245+00	1.3225+00	1.3253+00	1.3341+00	1.3496+00	1.3716+00	1.3995+00	1.4318+00	1.4669+00	1.5032+00
1.5389+00	1.5728+00	1.6043+00	1.6333+00	1.6604+00	1.6866+00	1.7136+00	1.7428+00	1.7759+00	1.8137+00
1.8567+00	1.9046+00	1.9560+00	2.0089+00	2.0606+00	2.1079+00	2.1475+00	2.1764+00	2.1921+00	2.1931+00
2.1788+00	2.1500+00	2.1086+00	2.0574+00	2.0003+00	1.9412+00	1.8846+00	1.8341+00	1.7931+00	1.7637+00
1.7471+00	1.7429+00	1.7500+00	1.7661+00	1.7884+00	1.8135+00	1.8384+00	1.8603+00	1.8772+00	1.8880+00
1.8924+00	1.8913+00	1.8861+00	1.8789+00	1.8719+00	1.8674+00	1.8671+00	1.8721+00	1.8828+00	1.8986+00
1.9182+00	1.9397+00	1.9607+00	1.9788+00	1.9919+00	1.9982+00	1.9970+00	1.9882+00	1.9727+00	1.9523+00
1.9293+00	1.9064+00	1.8863+00	1.8717+00	1.8642+00	1.8650+00	1.8742+00	1.8909+00	1.9135+00	1.9396+00
1.9665+00	1.9914+00	2.0121+00	2.0268+00	2.0347+00	2.0359+00	2.0316+00	2.0240+00	2.0156+00	2.0096+00
2.0090+00	2.0163+00	2.0332+00	2.0605+00	2.0975+00	2.1425+00	2.1924+00	2.2433+00	2.2907+00	2.3302+00
2.3574+00	2.3687+00	2.3617+00	2.3352+00	2.2895+00	2.2263+00	2.1486+00	2.0602+08	1.9655+00	1.8692+00
1.7756+00	1.6884+00	1.6104+00	1.5432+00	1.4872+00	1.4420+00	1.4060+00	1.3772+00	1.3532+00	1.3317+00
1.3107+00	1.2890+00	1.2659+00	1.2417+00						

SPAN STATION 4 CHORD STATION 4

3.3830-01	3.3019-01	3.2140-01	3.1259-01	3.0447-01	2.9768-01	2.9272-01	2.8990-01	2.8930-01	2.9075-01
2.9390-01	2.9818-01	3.0296-01	3.0755-01	3.1132-01	3.1375-01	3.1449-01	3.1340-01	3.1057-01	3.0627-01
3.0099-01	2.9532-01	2.8992-01	2.8548-01	2.8262-01	2.8185-01	2.8354-01	2.8788-01	2.9490-01	3.0444-01
3.1623-01	3.2986-01	3.4488-01	3.6079-01	3.7708-01	3.9329-01	4.0899-01	4.2381-01	4.3742-01	4.4956-01
4.5999-01	4.6852-01	4.7498-01	4.7923-01	4.8119-01	4.8079-01	4.7805-01	4.7307-01	4.6604-01	4.5723-01
4.4703-01	4.3592-01	4.2443-01	4.1313-01	4.0261-01	3.9340-01	3.8595-01	3.8059-01	3.7753-01	3.7679-01
3.7827-01	3.8170-01	3.8675-01	3.9297-01	3.9994-01	4.0722-01	4.1447-01	4.2144-01	4.2800-01	4.3413-01
4.3992-01	4.4555-01	4.5121-01	4.5712-01	4.6342-01	4.7019-01	4.7737-01	4.8481-01	4.9224-01	4.9928-01
5.0554-01	5.1060-01	5.1411-01	5.1585-01	5.1571-01	5.1378-01	5.1034-01	5.0581-01	5.0078-01	4.9586-01
4.9172-01	4.8893-01	4.8795-01	4.8902-01	4.9220-01	4.9728-01	5.0382-01	5.1124-01	5.1880-01	5.2575-01
5.3141-01	5.3521-01	5.3682-01	5.3617-01	5.3351-01	5.2934-01	5.2443-01	5.1971-01	5.1619-01	5.1483-01
5.1645-01	5.2162-01	5.3058-01	5.4317-01	5.5883-01	5.7665-01	5.9539-01	6.1362-01	6.2980-01	6.4247-01
6.5034-01	6.5243-01	6.4814-01	6.3736-01	6.2041-01	5.9899-01	5.7154-01	5.4216-01	5.1159-01	4.8154-01
4.5288-01	4.2741-01	4.0579-01	3.8851-01	3.7563-01	3.6683-01	3.6148-01	3.5871-01	3.5752-01	3.5691-01
3.5596-01	3.5395-01	3.5041-01	3.4516-01						

SPAN STATION 4 CHORD STATION 5

-3.7764-01	-3.7991-01	-3.8323-01	-3.8730-01	-3.9177-01	-3.9632-01	-4.0066-01	-4.0456-01	-4.0790-01	-4.1063-01
-4.1281-01	-4.1456-01	-4.1608-01	-4.1756-01	-4.1921-01	-4.2119-01	-4.2361-01	-4.2652-01	-4.2987-01	-4.3355-01
-4.3738-01	-4.4115-01	-4.4462-01	-4.4757-01	-4.4979-01	-4.5116-01	-4.5160-01	-4.5110-01	-4.4973-01	-4.4760-01
-4.4489-01	-4.4177-01	-4.3842-01	-4.3499-01	-4.3161-01	-4.2834-01	-4.2518-01	-4.2211-01	-4.1904-01	-4.1589-01

Figure 50. Continued.

-4.1256-01	-4.0896-01	-4.0507-01	-4.0088-01	-3.9646-01	-3.9194-01	-3.8749-01	-3.8330-01	-3.7962-01	-3.7663-01
-3.7454-01	-3.7346-01	-3.7347-01	-3.7454-01	-3.7658-01	-3.7942-01	-3.8284-01	-3.8656-01	-3.9029-01	-3.9375-01
-3.9668-01	-3.9888-01	-4.0020-01	-4.0053-01	-4.0001-01	-3.9857-01	-3.9639-01	-3.9362-01	-3.9046-01	-3.8710-01
-3.8372-01	-3.8047-01	-3.7746-01	-3.7477-01	-3.7243-01	-3.7046-01	-3.6881-01	-3.6745-01	-3.6633-01	-3.6538-01
-3.6457-01	-3.6385-01	-3.6310-01	-3.6261-01	-3.6205-01	-3.6153-01	-3.6102-01	-3.6050-01	-3.5996-01	-3.5935-01
-3.5866-01	-3.5784-01	-3.5689-01	-3.5579-01	-3.5454-01	-3.5319-01	-3.5176-01	-3.5032-01	-3.4892-01	-3.4759-01
-3.4638-01	-3.4527-01	-3.4423-01	-3.4318-01	-3.4199-01	-3.4053-01	-3.3863-01	-3.3612-01	-3.3287-01	-3.2880-01
-3.2387-01	-3.1816-01	-3.1182-01	-3.0513-01	-2.9843-01	-2.9213-01	-2.8671-01	-2.8262-01	-2.8031-01	-2.8014-01
-2.8234-01	-2.8705-01	-2.9420-01	-3.0357-01	-3.1480-01	-3.2737-01	-3.4067-01	-3.5404-01	-3.6679-01	-3.7830-01
-3.8805-01	-3.9564-01	-4.0084-01	-4.0361-01	-4.0407-01	-4.0253-01	-3.9941-01	-3.9523-01	-3.9056-01	-3.8596-01
-3.8192-01	-3.7885-01	-3.7705-01	-3.7664-01						

SPAN STATION 5 CHORD STATION 1

5.7527+00	5.6682+00	5.6265+00	5.6278+00	5.6709+00	5.7536+00	5.8724+00	6.0228+00	6.1995+00	6.3964+00
6.6072+00	6.8255+00	7.0455+00	7.2617+00	7.4697+00	7.6663+00	7.8494+00	8.0181+00	8.1728+00	8.3149+00
8.4464+00	8.5700+00	8.6863+00	8.8039+00	8.9190+00	9.0352+00	9.1533+00	9.2735+00	9.3951+00	9.5169+00
9.6373+00	9.7544+00	9.8664+00	9.9719+00	1.0070+01	1.0159+01	1.0240+01	1.0314+01	1.0381+01	1.0443+01
1.0502+01	1.0560+01	1.0617+01	1.0674+01	1.0733+01	1.0793+01	1.0854+01	1.0913+01	1.0979+01	1.1022+01
1.1067+01	1.1103+01	1.1129+01	1.1143+01	1.1145+01	1.1136+01	1.1115+01	1.1084+01	1.1045+01	1.1001+01
1.0952+01	1.0903+01	1.0854+01	1.0809+01	1.0767+01	1.0731+01	1.0701+01	1.0678+01	1.0660+01	1.0647+01
1.0639+01	1.0634+01	1.0631+01	1.0630+01	1.0629+01	1.0628+01	1.0626+01	1.0623+01	1.0618+01	1.0612+01
1.0605+01	1.0596+01	1.0587+01	1.0577+01	1.0568+01	1.0560+01	1.0554+01	1.0550+01	1.0549+01	1.0551+01
1.0558+01	1.0570+01	1.0586+01	1.0606+01	1.0631+01	1.0660+01	1.0692+01	1.0727+01	1.0765+01	1.0803+01
1.0843+01	1.0883+01	1.0924+01	1.0967+01	1.1010+01	1.1057+01	1.1106+01	1.1160+01	1.1219+01	1.1283+01
1.1352+01	1.1426+01	1.1503+01	1.1581+01	1.1657+01	1.1728+01	1.1789+01	1.1836+01	1.1864+01	1.1869+01
1.1847+01	1.1794+01	1.1708+01	1.1587+01	1.1430+01	1.1237+01	1.1011+01	1.0754+01	1.0468+01	1.0158+01
9.8281+00	9.4830+00	9.1277+00	8.7669+00	8.4056+00	8.0486+00	7.7006+00	7.3660+00	7.0493+00	6.7549+00
6.4869+00	6.2492+00	6.0456+00	5.8792+00						

SPAN STATION 5 CHORD STATION 2

1.5997+00	1.5720+00	1.5556+00	1.5511+00	1.5588+00	1.5784+00	1.6090+00	1.6492+00	1.6968+00	1.7491+00
1.8056+00	1.8618+00	1.9161+00	1.9667+00	2.0122+00	2.0518+00	2.0855+00	2.1137+00	2.1375+00	2.1581+00
2.1772+00	2.1964+00	2.2171+00	2.2407+00	2.2679+00	2.2990+00	2.3341+00	2.3726+00	2.4137+00	2.4564+00
2.4997+00	2.5424+00	2.5838+00	2.6233+00	2.6603+00	2.6950+00	2.7273+00	2.7575+00	2.7860+00	2.8130+00
2.8386+00	2.8626+00	2.8848+00	2.9045+00	2.9210+00	2.9334+00	2.9409+00	2.9428+00	2.9387+00	2.9285+00
2.9126+00	2.8918+00	2.8673+00	2.8405+00	2.8133+00	2.7873+00	2.7643+00	2.7455+00	2.7319+00	2.7239+00
2.7215+00	2.7240+00	2.7303+00	2.7389+00	2.7483+00	2.7567+00	2.7627+00	2.7652+00	2.7634+00	2.7571+00
2.7467+00	2.7328+00	2.7168+00	2.6998+00	2.6834+00	2.6688+00	2.6572+00	2.6492+00	2.6452+00	2.6449+00
2.6477+00	2.6526+00	2.6586+00	2.6644+00	2.6690+00	2.6715+00	2.6717+00	2.6692+00	2.6645+00	2.6584+00
2.6519+00	2.6462+00	2.6426+00	2.6420+00	2.6452+00	2.6527+00	2.6641+00	2.6791+00	2.6966+00	2.7155+00
2.7342+00	2.7514+00	2.7658+00	2.7767+00	2.7835+00	2.7863+00	2.7857+00	2.7826+00	2.7784+00	2.7746+00
2.7728+00	2.7743+00	2.7800+00	2.7905+00	2.8057+00	2.8248+00	2.8466+00	2.8694+00	2.8910+00	2.9093+00
2.9219+00	2.9271+00	2.9231+00	2.9089+00	2.8839+00	2.8483+00	2.8025+00	2.7477+00	2.6852+00	2.6166+00
2.5435+00	2.4673+00	2.3893+00	2.3108+00	2.2324+00	2.1549+00	2.0788+00	2.0046+00	1.9327+00	1.8638+00
1.7987+00	1.7384+00	1.6843+00	1.6376+00						

SPAN STATION 5 CHORD STATION 3

6.6846-01	6.3881-01	6.1418-01	5.9583-01	5.8485-01	5.8198-01	5.8756-01	6.0141-01	6.2281-01	6.5051-01
6.8313-01	7.1867-01	7.5527-01	7.9114-01	8.2471-01	8.5482-01	8.8078-01	9.0244-01	9.2013-01	9.3463-01
9.4706-01	9.5870-01	9.7086-01	9.8476-01	1.0013+00	1.0212+00	1.0446+00	1.0713+00	1.1010+00	1.1328+00
1.1658+00	1.1991+00	1.2318+00	1.2633+00	1.2931+00	1.3210+00	1.3469+00	1.3711+00	1.3938+00	1.4153+00
1.4358+00	1.4552+00	1.4733+00	1.4897+00	1.5037+00	1.5146+00	1.5214+00	1.5235+00	1.5203+00	1.5115+00
1.4973+00	1.4783+00	1.4554+00	1.4300+00	1.4038+00	1.3785+00	1.3559+00	1.3376+00	1.3248+00	1.3181+00
1.3178+00	1.3235+00	1.3342+00	1.3485+00	1.3647+00	1.3810+00	1.3956+00	1.4070+00	1.4139+00	1.4157+00
1.4124+00	1.4042+00	1.3922+00	1.3776+00	1.3620+00	1.3468+00	1.3336+00	1.3234+00	1.3169+00	1.3145+00
1.3161+00	1.3209+00	1.3281+00	1.3366+00	1.3453+00	1.3532+00	1.3594+00	1.3636+00	1.3658+00	1.3663+00

Figure 50. Continued.

1.3659+00	1.3654+00	1.3660+00	1.3686+00	1.3740+00	1.3828+00	1.3951+00	1.4106+00	1.4285+00	1.4480+00
1.4676+00	1.4862+00	1.5025+00	1.5137+00	1.5251+00	1.5308+00	1.5331+00	1.5329+00	1.5315+00	1.5302+00
1.5306+00	1.5341+00	1.5415+00	1.5536+00	1.5702+00	1.5907+00	1.6137+00	1.6376+00	1.6602+00	1.6792+00
1.6922+00	1.6972+00	1.6927+00	1.6777+00	1.6518+00	1.6154+00	1.5696+00	1.5139+00	1.4563+00	1.3929+00
1.3279+00	1.2631+00	1.2004+00	1.1406+00	1.0846+00	1.0325+00	9.8900-01	9.3860-01	8.9563-01	8.5442-01
8.1446-01	7.7556-01	7.3784-01	7.0185-01						

SPAN STATION 5 CHORD STATION 4

2.8498-01	2.7219-01	2.6039-01	2.5004-01	2.4162-01	2.3559-01	2.3235-01	2.3211-01	2.3496-01	2.4075-01
2.4915-01	2.5958-01	2.7171-01	2.8454-01	2.9748-01	3.0988-01	3.2120-01	3.3108-01	3.3933-01	3.4595-01
3.5114-01	3.5525-01	3.5872-01	3.6208-01	3.658[illegible]-01	3.7041-01	3.7620-01	3.8354-01	3.9222-01	4.0250-01
4.1411-01	4.2679-01	4.4022-01	4.5406-01	4.6795-01	4.8160-01	4.9474-01	5.0718-01	5.1875-01	5.2935-01
5.3887-01	5.4724-01	5.5432-01	5.6001-01	5.6412-01	5.6650-01	5.6697-01	5.6540-01	5.6172-01	5.5595-01
5.4825-01	5.3868-01	5.2827-01	5.1697-01	5.0560-01	4.9466-01	4.8541-01	4.7788-01	4.7274-01	4.7032-01
4.7072-01	4.7382-01	4.7928-01	4.8656-01	4.9497-01	5.0375-01	5.1210-01	5.1930-01	5.2476-01	5.2803-01
5.2905-01	5.2775-01	5.2445-01	5.1961-01	5.1384-01	5.0783-01	5.0224-01	4.9767-01	4.9458-01	4.9323-01
4.9372-01	4.9589-01	4.9944-01	5.0391-01	5.0880-01	5.1358-01	5.1778-01	5.2106-01	5.2323-01	5.2430-01
5.2446-01	5.2403-01	5.2347-01	5.2328-01	5.2396-01	5.2591-01	5.2939-01	5.3451-01	5.4116-01	5.4904-01
5.5770-01	5.6657-01	5.7503-01	5.8248-01	5.8844-01	5.9254-01	5.9467-01	5.9490-01	5.9355-01	5.9109-01
5.8818-01	5.8549-01	5.8370-01	5.8340-01	5.8500-01	5.8867-01	5.9434-01	6.0166-01	6.1004-01	6.1870-01
6.2675-01	6.3323-01	6.3726-01	6.3808-01	6.3514-01	6.2812-01	6.1702-01	6.0209-01	5.8382-01	5.6289-01
5.4011-01	5.1633-01	4.9234-01	4.6885-01	4.4640-01	4.2533-01	4.0580-01	3.8777-01	3.7107-01	3.5543-01
3.4056-01	3.2619-01	3.1215-01	2.9838-01						

SPAN STATION 5 CHORD STATION 5

4.6318-02	3.5544-02	2.3951-02	1.2104-02	6.8125-04	-9.6008-03	-1.8068-02	-2.4164-02	-2.7509-02	-2.7944-02
-2.5546-02	-2.0620-02	-1.3668-02	-5.3321-03	3.6684-03	1.2615-02	2.0862-02	2.7902-02	3.3412-02	3.7284-02
3.9630-02	4.0763-02	4.1161-02	4.1410-02	4.2145-02	4.3981-02	4.7449-02	5.2953-02	6.0725-02	7.0812-02
8.3080-02	9.7226-02	1.1262-01	1.2934-01	1.4624-01	1.6296-01	1.7900-01	1.9395-01	2.0749-01	2.1942-01
2.2964-01	2.3811-01	2.4469-01	2.5066-01	2.5373-01	2.5599-01	2.5692-01	2.5659-01	2.5505-01	2.5235-01
2.4855-01	2.4375-01	2.3808-01	2.3174-01	2.2496-01	2.1803-01	2.1129-01	2.0506-01	1.9965-01	1.9534-01
1.9230-01	1.9065-01	1.9037-01	1.9133-01	1.9334-01	1.9609-01	1.9925-01	2.0247-01	2.0541-01	2.0781-01
2.0948-01	2.1032-01	2.1036-01	2.0972-01	2.0857-01	2.0717-01	2.0575-01	2.0467-01	2.0402-01	2.0396-01
2.0454-01	2.0573-01	2.0740-01	2.0937-01	2.1144-01	2.1340-01	2.1509-01	2.1638-01	2.1727-01	2.1782-01
2.1817-01	2.1856-01	2.1926-01	2.2053-01	2.2264-01	2.2576-01	2.3000-01	2.3534-01	2.4166-01	2.4872-01
2.5623-01	2.6383-01	2.7117-01	2.7793-01	2.8389-01	2.8894-01	2.9309-01	2.9650-01	2.9941-01	3.0219-01
3.0520-01	3.0881-01	3.1331-01	3.1885-01	3.2542-01	3.3281-01	3.4063-01	3.4830-01	3.5512-01	3.6031-01
3.6309-01	3.6276-01	3.5875-01	3.5072-01	3.3860-01	3.2256-01	3.0308-01	2.8087-01	2.5680-01	2.3189-01
2.0717-01	1.8358-01	1.6194-01	1.4286-01	1.2666-01	1.1340-01	1.0287-01	9.4618-02	8.8023-02	8.2363-02
7.6903-02	7.0981-02	6.4080-02	5.5885-02						

COS AND SIN COEFFICIENTS OF ACOUSTIC PRESSURE PULSE AT EACH OF 144 AZIMUTHAL STATIONS AT EACH BLADE STATION FOR HARMONIC N= 1

BLADE STATION= 1

2.0029-02	2.0527-02	2.0978-02	2.1357-02	2.1648-02	2.1840-02	2.1935-02	2.1940-02	2.1871-02	2.1741-02
2.1597-02	2.1437-02	2.1326-02	2.1254-02	2.1245-02	2.1305-02	2.1429-02	2.1610-02	2.1832-02	2.2079-02
2.2335-02	2.2582-02	2.2804-02	2.2989-02	2.3129-02	2.3218-02	2.3255-02	2.3245-02	2.3189-02	2.3114-02
2.3015-02	2.2907-02	2.2796-02	2.2688-02	2.2580-02	2.2466-02	2.2336-02	2.2176-02	2.1972-02	2.1714-02
2.1394-02	2.1014-02	2.0579-02	2.0100-02	1.9589-02	1.9062-02	1.8533-02	1.8014-02	1.7516-02	1.7046-02
1.6610-02	1.6212-02	1.5855-02	1.5541-02	1.5274-02	1.5056-02	1.4888-02	1.4774-02	1.4715-02	1.4714-02
1.4774-02	1.4901-02	1.5097-02	1.5365-02	1.5703-02	1.6105-02	1.6554-02	1.7032-02	1.7510-02	1.7957-02
1.8346-02	1.8650-02	1.8853-02	1.8949-02	1.8937-02	1.8823-02	1.8616-02	1.8327-02	1.7970-02	1.7559-02
1.7112-02	1.6644-02	1.6165-02	1.5681-02	1.5197-02	1.4719-02	1.4255-02	1.3818-02	1.3419-02	1.3066-02
1.2759-02	1.2498-02	1.2277-02	1.2089-02	1.1927-02	1.1786-02	1.1665-02	1.1562-02	1.1481-02	1.1424-02
1.1394-02	1.1392-02	1.1418-02	1.1470-02	1.1544-02	1.1634-02	1.1731-02	1.1829-02	1.1921-02	1.2000-02
1.2062-02	1.2108-02	1.2139-02	1.2162-02	1.2186-02	1.2224-02	1.2294-02	1.2410-02	1.2587-02	1.2836-02
1.3161-02	1.3558-02	1.4014-02	1.4512-02	1.5029-02	1.5540-02	1.6019-02	1.6445-02	1.6802-02	1.7079-02
1.7274-02	1.7390-02	1.7439-02	1.7438-02	1.7412-02	1.7388-02	1.7395-02	1.7459-02	1.7600-02	1.7828-02

Figure 50. Continued.

1.8146	1.8545-02	1.90[illegible]-02	1.9513-02						
-8.2116-03	-8.3771-03	-8.5257-03	-8.6480-03	-8.7374-03	-8.7901-03	-8.8059-03	-8.7870-03	-8.7389-03	-8.6687-03
-8.5860-03	-8.4976-03	-8.4246-03	-8.3648-03	-8.3278-03	-8.3164-03	-8.3304-03	-8.3670-03	-8.4216-03	-8.4884-03
-8.5608-03	-8.6323-03	-8.6971-03	-8.7504-03	-8.7888-03	-8.8107-03	-8.8161-03	-8.8069-03	-8.7842-03	-8.7578-03
-8.7264-03	-8.6952-03	-8.6669-03	-8.6427-03	-8.6217-03	-8.6011-03	-8.5762-03	-8.5414-03	-8.4912-03	-8.4213-03
-8.3297-03	-8.2165-03	-8.0845-03	-7.9399-03	-7.7817-03	-7.6211-03	-7.4604-03	-7.3034-03	-7.1527-03	-7.0097-03
-6.8755-03	-6.7506-03	-6.6358-03	-6.5321-03	-6.4411-03	-6.3643-03	-6.3033-03	-6.2596-03	-6.2342-03	-6.2284-03
-6.2436-03	-6.2813-03	-6.3430-03	-6.4296-03	-6.5407-03	-6.6739-03	-6.8241-03	-6.9840-03	-7.1437-03	-7.2926-03
-7.4202-03	-7.5186-03	-7.5832-03	-7.6133-03	-7.6111-03	-7.5802-03	-7.5253-03	-7.4511-03	-7.3630-03	-7.2661-03
-7.1649-03	-7.0628-03	-6.9604-03	-6.8564-03	-6.7482-03	-6.6347-03	-6.5167-03	-6.3975-03	-6.2805-03	-6.1692-03
-6.0657-03	-5.9708-03	-5.8847-03	-5.8074-03	-5.7390-03	-5.6800-03	-5.6317-03	-5.5958-03	-5.5741-03	-5.5680-03
-5.5781-03	-5.6039-03	-5.6439-03	-5.6952-03	-5.7541-03	-5.8164-03	-5.8775-03	-5.9331-03	-5.9793-03	-6.0131-03
-6.0326-03	-6.0371-03	-6.0277-03	-6.0070-03	-5.9794-03	-5.9510-03	-5.9293-03	-5.9223-03	-5.9379-03	-5.9821-03
-6.0582-03	-6.1663-03	-6.3028-03	-6.4611-03	-6.6325-03	-6.8067-03	-6.9736-03	-7.1243-03	-7.2515-03	-7.3507-03
-7.4196-03	-7.4589-03	-7.4718-03	-7.4642-03	-7.4441-03	-7.4217-03	-7.4076-03	-7.4120-03	-7.4429-03	-7.5052-03
-7.6000-03	-7.7251-03	-7.8747-03	-8.0404-03						

BLADE STATION= 2

3.9301-02	4.0189-02	4.1050-02	4.1884-02	4.2631-02	4.3273-02	4.3790-02	4.4165-02	4.4393-02	4.4478-02
4.4431-02	4.4271-02	4.4023-02	4.3710-02	4.3358-02	4.2989-02	4.2622-02	4.2270-02	4.1942-02	4.1642-02
4.1370-02	4.1122-02	4.0891-02	4.0670-02	4.0450-02	4.0223-02	3.9985-02	3.9732-02	3.9465-02	3.9156-02
3.8901-02	3.8613-02	3.8329-02	3.8054-02	3.7788-02	3.7534-02	3.7289-02	3.7047-02	3.6801-02	3.6542-02
3.6259-02	3.5940-02	3.5576-02	3.5158-02	3.4681-02	3.4144-02	3.3549-02	3.2904-02	3.2218-02	3.1534-02
3.0778-02	3.0054-02	2.9349-02	2.8676-02	2.8050-02	2.7482-02	2.6984-02	2.6564-02	2.6227-02	2.5977-02
2.5811-02	2.5727-02	2.5714-02	2.5763-02	2.5859-02	2.5987-02	2.6132-02	2.6277-02	2.6408-02	2.6512-02
2.6579-02	2.6601-02	2.6573-02	2.6493-02	2.6363-02	2.6189-02	2.5976-02	2.5735-02	2.5476-02	2.5210-02
2.4950-02	2.4705-02	2.4485-02	2.4299-02	2.4152-02	2.4050-02	2.3998-02	2.3999-02	2.4052-02	2.4158-02
2.4313-02	2.4512-02	2.4746-02	2.5006-02	2.5280-02	2.5558-02	2.5829-02	2.6086-02	2.6324-02	2.6539-02
2.6730-02	2.6899-02	2.7045-02	2.7169-02	2.7275-02	2.7364-02	2.7440-02	2.7507-02	2.7572-02	2.7641-02
2.7721-02	2.7819-02	2.7938-02	2.8082-02	2.8252-02	2.8448-02	2.8669-02	2.8914-02	2.9179-02	2.9462-02
2.9758-02	3.0063-02	3.0372-02	3.0680-02	3.0983-02	3.1277-02	3.1557-02	3.1821-02	3.2069-02	3.2301-02
3.2519-02	3.2730-02	3.2940-02	3.3161-02	3.3405-02	3.3687-02	3.4020-02	3.4417-02	3.4888-02	3.5442-02
3.6078-02	3.6794-02	3.7580-02	3.8423-02						
-5.0087-03	-5.1201-03	-5.2300-03	-5.3345-03	-5.4299-03	-5.5124-03	-5.5792-03	-5.6282-03	-5.6587-03	-5.6712-03
-5.6676-03	-5.6507-03	-5.6238-03	-5.5901-03	-5.5525-03	-5.5136-03	-5.4749-03	-5.4376-03	-5.4020-03	-5.3681-03
-5.3354-03	-5.3031-03	-5.2706-03	-5.2369-03	-5.2016-03	-5.1643-03	-5.1251-03	-5.0844-03	-5.0429-03	-5.0016-03
-4.9616-03	-4.9237-03	-4.8888-03	-4.8574-03	-4.8297-03	-4.8053-03	-4.7836-03	-4.7635-03	-4.7438-03	-4.7229-03
-4.6993-03	-4.6714-03	-4.6380-03	-4.5981-03	-4.5510-03	-4.4967-03	-4.4353-03	-4.3676-03	-4.2945-03	-4.2172-03
-4.1371-03	-4.0557-03	-3.9744-03	-3.8948-03	-3.8182-03	-3.7460-03	-3.6796-03	-3.6201-03	-3.5685-03	-3.5257-03
-3.4921-03	-3.4679-03	-3.4529-03	-3.4465-03	-3.4477-03	-3.4552-03	-3.4672-03	-3.4820-03	-3.4976-03	-3.5119-03
-3.5230-03	-3.5293-03	-3.5294-03	-3.5225-03	-3.5081-03	-3.4865-03	-3.4585-03	-3.4252-03	-3.3883-03	-3.3497-03
-3.3114-03	-3.2755-03	-3.2436-03	-3.2174-03	-3.1978-03	-3.1856-03	-3.1811-03	-3.1840-03	-3.1937-03	-3.2094-03
-3.2297-03	-3.2531-03	-3.2781-03	-3.3030-03	-3.3265-03	-3.3474-03	-3.3652-03	-3.3795-03	-3.3907-03	-3.3994-03
-3.4064-03	-3.4128-03	-3.4194-03	-3.4268-03	-3.4356-03	-3.4460-03	-3.4582-03	-3.4720-03	-3.4873-03	-3.5038-03
-3.5213-03	-3.5394-03	-3.5580-03	-3.5769-03	-3.5961-03	-3.6159-03	-3.6364-03	-3.6581-03	-3.6815-03	-3.7070-03
-3.7350-03	-3.7657-03	-3.7990-03	-3.8347-03	-3.8726-03	-3.9119-03	-3.9520-03	-3.9922-03	-4.0319-03	-4.0706-03
-4.1081-03	-4.1445-03	-4.1803-03	-4.2165-03	-4.2544-03	-4.2956-03	-4.3419-03	-4.3950-03	-4.4563-03	-4.5267-03
-4.6067-03	-4.6962-03	-4.7941-03	-4.8991-03						

BLADE STATION= 3

3.6803-02	3.7269-02	3.7703-02	3.8097-02	3.8446-02	3.8765-02	3.8995-02	3.9190-02	3.9329-02	3.9408-02
3.9424-02	3.9372-02	3.9205-02	3.9050-02	3.8772-02	3.8413-02	3.7976-02	3.7464-02	3.6887-02	3.6259-02
3.5595-02	3.4915-02	3.4238-02	3.3583-02	3.2966-02	3.2400-02	3.1895-02	3.1456-02	3.1085-02	3.0778-02
3.0528-02	3.0323-02	3.0151-02	2.9992-02	2.9829-02	2.9642-02	2.9412-02	2.9121-02	2.8755-02	2.8304-02
2.7762-02	2.7132-02	2.6419-02	2.5635-02	2.4798-02	2.3931-02	2.3059-02	2.2209-02	2.1407-02	2.0679-02
2.0048-02	1.9529-02	1.9135-02	1.8871-02	1.8738-02	1.8730-02	1.8837-02	1.9046-02	1.9341-02	1.9706-02
2.0122-02	2.0572-02	2.1041-02	2.1513-02	2.1977-02	2.2423-02	2.2845-02	2.3237-02	2.3596-02	2.3920-02
2.4206-02	2.4453-02	2.4656-02	2.4812-02	2.4917-02	2.4969-02	2.4968-02	2.4914-02	2.4811-02	2.4666-02
2.4489-02	2.4289-02	2.4081-02	2.3876-02	2.3689-02	2.3535-02	2.3428-02	2.3380-02	2.3402-02	2.3501-02
2.3678-02	2.3930-02	2.4246-02	2.4613-02	2.5014-02	2.5428-02	2.5838-02	2.6223-02	2.6570-02	2.6866-02
2.7104-02	2.7281-02	2.7400-02	2.7469-02	2.7500-02	2.7508-02	2.7511-02	2.7524-02	2.7563-02	2.7639-02
2.7760-02	2.7926-02	2.8136-02	2.8383-02	2.8658-02	2.8950-02	2.9248-02	2.9540-02	2.9817-02	3.0870-02

Figure 50. Continued.

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  3.0291-02   3.0474-02   3.0618-02   3.0724-02   3.0796-02   3.0844-02   3.0879-02   3.0914-02   3.0962-02   3.1036-02
  3.1148-02   3.1307-02   3.1516-02   3.1778-02   3.2091-02   3.2452-02   3.2856-02   3.3296-02   3.3766-02   3.4259-02
  3.4768-02   3.5285-02   3.5802-02   3.6311-02
   -1.7668-03  -1.8356-03  -1.8930-03  -1.9382-03  -1.9716-03  -1.9951-03  -2.0101-03  -2.0200-03  -2.0269-03  -2.0330-03
 -2.0393-03  -2.0463-03  -2.0520-03  -2.0578-03  -2.0581-03  -2.0511-03  -2.0337-03  -2.0037-03  -1.9594-03  -1.9004-03
 -1.8277-03  -1.7437-03  -1.6516-03  -1.5554-03  -1.4593-03  -1.3675-03  -1.2833-03  -1.2097-03  -1.1484-03  -1.1001-03
 -1.0646-03  -1.0405-03  -1.0255-03  -1.0166-03  -1.0105-03  -1.0035-03  -9.9224-04  -9.7357-04  -9.4517-04  -9.0543-04
 -8.5375-04  -7.9033-04  -7.1621-04  -6.3300-04  -5.4283-04  -4.4799-04  -3.5085-04  -2.5360-04  -1.5831-04  -6.6699-05
  1.9737-05   9.9707-05   1.7204-04   2.3567-04   2.8966-04   3.3295-04   3.6491-04   3.8490-04   3.9269-04   3.8840-04
  3.7265-04   3.4656-04   3.1185-04   2.7073-04   2.2597-04   1.8061-04   1.3792-04   1.0114-04   7.3141-05   5.6182-05
  5.1704-05   6.0097-05   8.0700-05   1.1187-04   1.5113-04   1.9548-04   2.4162-04   2.8623-04   3.2622-04   3.5898-04
  3.8253-04   3.9570-04   3.9814-04   3.9040-04   3.7373-04   3.4999-04   3.2136-04   2.9008-04   2.5818-04   2.2720-04
  1.9809-04   1.7107-04   1.4573-04   1.2112-04   9.6021-05   6.9083-05   3.9096-05   5.1739-06  -3.3122-05  -7.5674-05
 -1.2166-04  -1.6971-04  -2.1786-04  -2.6382-04  -3.0517-04  -3.3969-04  -3.6567-04  -3.8222-04  -3.8934-04  -3.8817-04
 -3.8070-04  -3.6968-04  -3.5826-04  -3.4978-04  -3.4742-04  -3.5401-04  -3.7177-04  -4.0218-04  -4.4572-04  -5.0179-04
 -5.6851-04  -6.4292-04  -7.2115-04  -7.9887-04  -8.7173-04  -9.3578-04  -9.8822-04  -1.0274-03  -1.0536-03  -1.0686-03
 -1.0755-03  -1.0783-03  -1.0812-03  -1.0884-03  -1.1034-03  -1.1288-03  -1.1662-03  -1.2161-03  -1.2782-03  -1.3509-03
 -1.4317-03  -1.5175-03  -1.6044-03  -1.6888-03

BLADE STATION= 4
   4.0274-02   4.0253-02   4.0195-02   4.0071-02   3.9900-02   3.9651-02   3.9454-02   3.9274-02   3.9198-02   3.9273-02
  3.9517-02   3.9925-02   4.0477-02   4.1143-02   4.1898-02   4.2719-02   4.3586-02   4.4473-02   4.5330-02   4.6082-02
  4.6651-02   4.6960-02   4.6989-02   4.6763-02   4.6309-02   4.5856-02   4.5437-02   4.5232-02   4.5347-02   4.5863-02
  4.6851-02   4.8393-02   5.0607-02   5.3654-02   5.7664-02   6.2311-02   6.6698-02   7.0420-02   7.3630-02   7.6503-02
  7.9124-02   8.1530-02   8.3721-02   6.5663-02   8.7294-02   8.8536-02   8.9318-02   8.9588-02   8.9332-02   6.8586-02
  8.7443-02   8.6053-02   8.4604-02   8.3278-02   8.2199-02   8.1414-02   8.0908-02   8.0650-02   8.0606-02   8.0750-02
  8.1061-02   8.1519-02   8.2095-02   8.2744-02   8.3397-02   8.3970-02   8.4382-02   8.4563-02   8.4474-02   8.4109-02
  8.3497-02   8.2697-02   8.1788-02   8.0863-02   8.0012-02   7.9312-02   7.8817-02   7.8553-02   7.8511-02   7.6656-02
  7.8932-02   7.9269-02   7.9595-02   7.9848-02   7.9981-02   7.9973-02   7.9831-02   7.9592-02   7.9310-02   7.9056-02
  7.8897-02   7.8890-02   7.9074-02   7.9469-02   8.0072-02   8.0858-02   8.1783-02   8.2785-02   8.3790-02   8.4712-02
  8.5467-02   8.5979-02   8.6188-02   8.6065-02   8.5616-02   8.4883-02   8.3951-02   8.2941-02   8.1997-02   8.1277-02
  8.0924-02   8.1037-02   8.1651-02   8.2736-02   8.4205-02   8.5928-02   8.7746-02   8.9491-02   9.0992-02   9.2087-02
  9.2635-02   9.2526-02   9.1686-02   9.0090-02   8.7754-02   8.4733-02   8.1117-02   7.7017-02   7.2565-02   6.7913-02
  6.3232-02   5.8723-02   5.4597-02   5.1042-02   4.8041-02   4.5682-02   4.3886-02   4.2577-02   4.1664-02   4.1058-02
  4.0677-02   4.0456-02   4.0341-02   4.0292-02
   -5.2741-03  -5.3255-03  -5.3716-03  -5.4034-03  -5.4178-03  -5.4081-03  -5.3910-03  -5.3617-03  -5.3350-03  -5.3210-03
 -5.3265-03  -5.3551-03  -5.4080-03  -5.4849-03  -5.5851-03  -5.7078-03  -5.8507-03  -6.0091-03  -6.1728-03  -6.3258-03
 -6.4503-03  -6.5290-03  -6.5540-03  -6.5253-03  -6.4456-03  -6.3496-03  -6.2449-03  -6.1614-03  -6.1190-03  -6.1328-03
 -6.2170-03  -6.3880-03  -6.6681-03  -7.0871-03  -7.6691-03  -8.3585-03  -8.9976-03  -9.5156-03  -9.9430-03  -1.0314-02
 -1.0644-02  -1.0941-02  -1.1208-02  -1.1441-02  -1.1634-02  -1.1779-02  -1.1868-02  -1.1895-02  -1.1859-02  -1.1765-02
 -1.1626-02  -1.1464-02  -1.1305-02  -1.1175-02  -1.1087-02  -1.1043-02  -1.1036-02  -1.1056-02  -1.1094-02  -1.1146-02
 -1.1206-02  -1.1272-02  -1.1341-02  -1.1409-02  -1.1469-02  -1.1513-02  -1.1531-02  -1.1517-02  -1.1467-02  -1.1381-02
 -1.1265-02  -1.1125-02  -1.0972-02  -1.0818-02  -1.0674-02  -1.0550-02  -1.0454-02  -1.0387-02  -1.0351-02  -1.0340-02
 -1.0348-02  -1.0367-02  -1.0388-02  -1.0406-02  -1.0415-02  -1.0412-02  -1.0399-02  -1.0380-02  -1.0362-02  -1.0352-02
 -1.0357-02  -1.0382-02  -1.0429-02  -1.0498-02  -1.0588-02  -1.0693-02  -1.0809-02  -1.0929-02  -1.1044-02  -1.1145-02
 -1.1224-02  -1.1272-02  -1.1282-02  -1.1252-02  -1.1182-02  -1.1077-02  -1.0945-02  -1.0801-02  -1.0662-02  -1.0548-02
 -1.0477-02  -1.0462-02  -1.0507-02  -1.0606-02  -1.0749-02  -1.0921-02  -1.1102-02  -1.1274-02  -1.1421-02  -1.1524-02
 -1.1569-02  -1.1546-02  -1.1445-02  -1.1265-02  -1.1004-02  -1.0668-02  -1.0262-02  -9.7960-03  -9.2794-03  -8.7264-03
 -8.1556-03  -7.5925-03  -7.0667-03  -6.6016-03  -6.2086-03  -5.8898-03  -5.6410-03  -5.4552-03  -5.3241-03  -5.2394-03
 -5.1937-03  -5.1804-03  -5.1936-03  -5.2272-03

BLADE STATION= 5
   4.0706-02   4.0459-02   4.0415-02   4.0527-02   4.0796-02   4.1251-02   4.1913-02   4.2778-02   4.3815-02   4.4978-02
  4.6210-02   4.7457-02   4.8584-02   4.9795-02   5.0806-02   5.1675-02   5.2405-02   5.3022-02   5.3563-02   5.4064-02
  5.1544-02   5.5004-02   5.5426-02   5.5777-02   5.6020-02   5.6104-02   5.5962-02   5.5499-02   5.4608-02   5.3220-02
  5.1529-02   5.0371-02   4.9567-02   4.9204-02   4.9106-02   4.9201-02   4.9420-02   4.9714-02   5.0050-02   5.0404-02
  5.0756-02   5.1092-02   5.1395-02   5.1651-02   5.1842-02   5.1954-02   5.1972-02   5.1886-02   5.1691-02   5.1389-02
  5.0991-02   5.0516-02   4.9992-02   4.9450-02   4.8927-02   4.8460-02   4.8079-02   4.7808-02   4.7660-02   4.7634-02
  4.7721-02   4.7902-02   4.8152-02   4.8443-02   4.8747-02   4.9032-02   4.9270-02   4.9437-02   4.9517-02   4.9500-02
  4.9388-02   4.9195-02   4.8940-02   4.8649-02   4.8351-02   4.8074-02   4.7841-02   4.7668-02   4.7566-02   4.7535-02
  4.7572-02   4.7663-02   4.7794-02   4.7942-02   4.8086-02   4.8205-02   4.8283-02   4.8310-02   4.8282-02   4.8205-02
  4.8093-02   4.7963-02   4.7839-02   4.7743-02   4.7699-02   4.7724-02   4.7829-02   4.8016-02   4.8277-02   4.8595-02
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Figure 50. Continued.

4.8944-02	4.9294-02	4.9616-02	4.9830-02	5.0066-02	5.0162-02	5.0164-02	5.0084-02	4.9940-02	4.9758-02
4.9573-02	4.9419-02	4.9328-02	4.9325-02	4.9428-02	4.9659-02	4.9950-02	5.0336-02	5.0762-02	5.1187-02
5.1563-02	5.1849-02	5.2005-02	5.2002-02	5.1822-02	5.1460-02	5.0930-02	5.0272-02	4.9543-02	4.8823-02
4.8204-02	4.7787-02	4.7659-02	4.7855-02	4.8260-02	4.8476-02	4.8107-02	4.7259-02	4.6159-02	4.4976-02
4.3825-02	4.2780-02	4.1868-02	4.1187-02						
-4.8289-03	-4.8771-03	-4.9529-03	-5.0467-03	-5.1541-03	-5.2747-03	-5.4079-03	-5.5508-03	-5.6987-03	-5.8455-03
-5.9850-03	-6.1118-03	-6.2290-03	-6.3135-03	-6.3849-03	-6.4379-03	-6.4767-03	-6.5086-03	-6.5407-03	-6.5786-03
-6.6234-03	-6.6724-03	-6.7189-03	-6.7535-03	-6.7657-03	-6.7430-03	-6.6706-03	-6.5299-03	-6.3014-03	-5.9746-03
-5.6016-03	-5.2763-03	-5.0269-03	-4.8439-03	-4.7115-03	-4.6162-03	-4.5478-03	-4.4993-03	-4.4657-03	-4.4432-03
-4.4291-03	-4.4211-03	-4.4169-03	-4.4148-03	-4.4129-03	-4.4098-03	-4.4041-03	-4.3952-03	-4.3826-03	-4.3667-03
-4.3454-03	-4.3292-03	-4.3108-03	-4.2954-03	-4.2848-03	-4.2806-03	-4.2836-03	-4.2934-03	-4.3088-03	-4.3275-03
-4.3470-03	-4.3646-03	-4.3785-03	-4.3874-03	-4.3907-03	-4.3883-03	-4.3804-03	-4.3677-03	-4.3510-03	-4.3314-03
-4.3104-03	-4.2894-03	-4.2701-03	-4.2537-03	-4.2411-03	-4.2326-03	-4.2280-03	-4.2265-03	-4.2271-03	-4.2287-03
-4.2303-03	-4.2312-03	-4.2307-03	-4.2283-03	-4.2238-03	-4.2166-03	-4.2069-03	-4.1945-03	-4.1797-03	-4.1629-03
-4.1446-03	-4.1255-03	-4.1061-03	-4.0871-03	-4.0694-03	-4.0537-03	-4.0406-03	-4.0304-03	-4.0232-03	-4.0183-03
-4.0149-03	-4.0117-03	-4.0076-03	-4.0015-03	-3.9924-03	-3.9800-03	-3.9641-03	-3.9451-03	-3.9236-03	-3.9087-03
-3.8777-03	-3.8560-03	-3.8373-03	-3.8231-03	-3.8143-03	-3.8116-03	-3.8147-03	-3.8231-03	-3.8354-03	-3.8504-03
-3.8666-03	-3.8829-03	-3.8988-03	-3.9139-03	-3.9287-03	-3.9444-03	-3.9634-03	-3.9896-03	-4.0285-03	-4.0873-03
-4.1749-03	-4.3010-03	-4.4736-03	-4.6927-03	-4.9349-03	-3.1305-03	-5.2129-03	-5.2009-03	-5.1352-03	-5.0472-03
-4.9590-03	-4.8852-03	-4.8351-03	-4.8151-03						

COS AND SIN COEFFICIENTS OF ACOUSTIC PRESSURE PULSE AT EACH OF 144 AZIMUTHAL STATIONS AT EACH BLADE STATION FOR HARMONIC N= 2

BLADE STATION= 1

1.6959-02	1.7390-02	1.7769-02	1.8089-02	1.8337-02	1.8505-02	1.8595-02	1.8615-02	1.8577-02	1.8499-02
1.8402-02	1.8309-02	1.8241-02	1.8214-02	1.8238-02	1.8316-02	1.8443-02	1.8611-02	1.8807-02	1.9017-02
1.9227-02	1.9423-02	1.9593-02	1.9729-02	1.9823-02	1.9873-02	1.9879-02	1.9845-02	1.9765-02	1.9687-02
1.9579-02	1.9464-02	1.9346-02	1.9229-02	1.9111-02	1.8987-02	1.8848-02	1.8683-02	1.8482-02	1.8237-02
1.7943-02	1.7601-02	1.7215-02	1.6795-02	1.6352-02	1.5898-02	1.5444-02	1.5002-02	1.4580-02	1.4185-02
1.3821-02	1.3492-02	1.3198-02	1.2941-02	1.2723-02	1.2544-02	1.2406-02	1.2311-02	1.2261-02	1.2259-02
1.2308-02	1.2414-02	1.2579-02	1.2807-02	1.3096-02	1.3441-02	1.3831-02	1.4247-02	1.4668-02	1.5067-02
1.5420-02	1.5704-02	1.5905-02	1.6011-02	1.6022-02	1.5941-02	1.5772-02	1.5524-02	1.5208-02	1.4839-02
1.4430-02	1.3996-02	1.3548-02	1.3095-02	1.2643-02	1.2199-02	1.1773-02	1.1377-02	1.1018-02	1.0702-02
1.0431-02	1.0202-02	1.0010-02	9.8475-03	9.7092-03	9.5903-03	9.4882-03	9.4025-03	9.3344-03	9.2862-03
9.2599-03	9.2569-03	9.2772-03	9.3190-03	9.3790-03	9.4522-03	9.5331-03	9.6154-03	9.6933-03	9.7624-03
9.8200-03	9.8659-03	9.9026-03	9.9359-03	9.9741-03	1.0028-02	1.0111-02	1.0234-02	1.0410-02	1.0645-02
1.0940-02	1.1293-02	1.1691-02	1.2121-02	1.2562-02	1.2995-02	1.3403-02	1.3759-02	1.4058-02	1.4292-02
1.4458-02	1.4561-02	1.4610-02	1.4621-02	1.4615-02	1.4614-02	1.4641-02	1.4716-02	1.4856-02	1.5066-02
1.5353-02	1.5702-02	1.6102-02	1.6532-02						
-1.5435-02	-1.5745-02	-1.6024-02	-1.6253-02	-1.6420-02	-1.6520-02	-1.6550-02	-1.6517-02	-1.6429-02	-1.6300-02
-1.6148-02	-1.5992-02	-1.5852-02	-1.5743-02	-1.5676-02	-1.5657-02	-1.5686-02	-1.5756-02	-1.5859-02	-1.5985-02
-1.6121-02	-1.6254-02	-1.6375-02	-1.6473-02	-1.6542-02	-1.6581-02	-1.6588-02	-1.6567-02	-1.6515-02	-1.6469-02
-1.6407-02	-1.6345-02	-1.6288-02	-1.6239-02	-1.6195-02	-1.6151-02	-1.6099-02	-1.6028-02	-1.5929-02	-1.5793-02
-1.5616-02	-1.5400-02	-1.5149-02	-1.4872-02	-1.4578-02	-1.4275-02	-1.3974-02	-1.3679-02	-1.3397-02	-1.3130-02
-1.2879-02	-1.2646-02	-1.2432-02	-1.2239-02	-1.2069-02	-1.1926-02	-1.1811-02	-1.1729-02	-1.1681-02	-1.1670-02
-1.1698-02	-1.1768-02	-1.1883-02	-1.2046-02	-1.2255-02	-1.2505-02	-1.2789-02	-1.3091-02	-1.3394-02	-1.3677-02
-1.3921-02	-1.4111-02	-1.4237-02	-1.4299-02	-1.4298-02	-1.4243-02	-1.4141-02	-1.4002-02	-1.3836-02	-1.3652-02
-1.3458-02	-1.3262-02	-1.3065-02	-1.2864-02	-1.2655-02	-1.2437-02	-1.2212-02	-1.1985-02	-1.1763-02	-1.1552-02
-1.1357-02	-1.1178-02	-1.1016-02	-1.0870-02	-1.0741-02	-1.0630-02	-1.0540-02	-1.0472-02	-1.0432-02	-1.0421-02
-1.0440-02	-1.0489-02	-1.0565-02	-1.0661-02	-1.0772-02	-1.0890-02	-1.1005-02	-1.1110-02	-1.1197-02	-1.1260-02
-1.1297-02	-1.1306-02	-1.1289-02	-1.1251-02	-1.1201-02	-1.1149-02	-1.1111-02	-1.1100-02	-1.1131-02	-1.1216-02
-1.1361-02	-1.1565-02	-1.1823-02	-1.2121-02	-1.2442-02	-1.2769-02	-1.3083-02	-1.3365-02	-1.3604-02	-1.3791-02
-1.3921-02	-1.3996-02	-1.4022-02	-1.4010-02	-1.3976-02	-1.3936-02	-1.3913-02	-1.3924-02	-1.3985-02	-1.4104-02
-1.4284-02	-1.4520-02	-1.4802-02	-1.5113-02						

BLADE STATION= 2

3.8131-02	3.8926-02	3.9625-02	4.0618-02	4.1336-02	4.1955-02	4.2453-02	4.2815-02	4.3037-02	4.3121-02
4.3079-02	4.2929-02	4.2693-02	4.2396-02	4.2060-02	4.1707-02	4.1355-02	4.1017-02	4.0702-02	4.0413-02
4.0152-02	3.9915-02	3.9694-02	3.9482-02	3.9272-02	3.9056-02	3.8829-02	3.8589-02	3.8334-02	3.8069-02
3.7796-02	3.7521-02	3.7249-02	3.6984-02	3.6729-02	3.6484-02	3.6246-02	3.6012-02	3.5774-02	3.5522-02
3.5247-02	3.4939-02	3.4586-02	3.4183-02	3.3723-02	3.3205-02	3.2632-02	3.2011-02	3.1350-02	3.0662-02
2.7962-02	2.9264-02	2.8583-02	2.7934-02	2.7328-02	2.6779-02	2.6297-02	2.5889-02	2.5562-02	2.5318-02

Figure 50. Continued.

2.5156-02	2.5073-02	2.5059-02	2.5105-02	2.5197-02	2.5320-02	2.5459-02	2.5599-02	2.5725-02	2.5816-02
2.5890-02	2.5911-02	2.5884-02	2.5807-02	2.5682-02	2.5514-02	2.5310-02	2.5079-02	2.4831-02	2.4576-02
2.4327-02	2.4092-02	2.3881-02	2.3701-02	2.3559-02	2.3460-02	2.3408-02	2.3405-02	2.3454-02	2.3552-02
2.3699-02	2.3888-02	2.4112-02	2.4362-02	2.4626-02	2.4896-02	2.5160-02	2.5411-02	2.5645-02	2.5858-02
2.6048-02	2.6216-02	2.6361-02	2.6486-02	2.6591-02	2.6678-02	2.6751-02	2.6815-02	2.6876-02	2.6940-02
2.7015-02	2.7105-02	2.7217-02	2.7353-02	2.7515-02	2.7702-02	2.7915-02	2.8151-02	2.8407-02	2.86[illegible]0-02
2.8966-02	2.9260-02	2.9558-02	2.9854-02	3.0144-02	3.0424-02	3.0691-02	3.0942-02	3.1177-02	3.1396-02
3.1603-02	3.1802-02	3.2002-02	3.2213-02	3.2446-02	3.2717-02	3.3037-02	3.3421-02	3.3876-02	3.44[illegible]0-02
3.5024-02	3.5715-02	3.6473-02	3.7285-02						

-9.8614-03	-1.0086-02	-1.0296-02	-1.0501-02	-1.0688-02	-1.0850-02	-1.0981-02	-1.1078-02	-1.1138-02	-1.1162-02
-1.1156-02	-1.1123-02	-1.1070-02	-1.1005-02	-1.0931-02	-1.0855-02	-1.0780-02	-1.0707-02	-1.0637-02	-1.0571-02
-1.0506-02	-1.0443-02	-1.0379-02	-1.0313-02	-1.0244-02	-1.0171-02	-1.0094-02	-1.0014-02	-9.9324-03	-9.85[illegible]3-03
-9.7727-03	-9.6984-03	-9.6300-03	-9.5685-03	-9.5141-03	-9.4663-03	-9.4237-03	-9.3844-03	-9.3456-03	-9.3046-03
-9.2581-03	-9.2034-03	-9.1378-03	-9.0593-03	-8.9669-03	-8.8602-03	-8.7396-03	-8.6066-03	-8.4629-03	-8.31[illegible]1-03
-8.1537-03	-7.9936-03	-7.8338-03	-7.6770-03	-7.5262-03	-7.3841-03	-7.2532-03	-7.1359-03	-7.0342-03	-6.9446-03
-6.8833-03	-6.8354-03	-6.8057-03	-6.7930-03	-6.7952-03	-6.8097-03	-6.8335-03	-6.8626-03	-6.8932-03	-6.9214-03
-6.9434-03	-6.9558-03	-6.9562-03	-6.9427-03	-6.9146-03	-6.8723-03	-6.8172-03	-6.7518-03	-6.6794-03	-6.6[illegible]5-03
-6.5283-03	-6.4576-03	-6.3950-03	-6.3433-03	-6.3047-03	-6.2807-03	-6.2717-03	-6.2773-03	-6.2963-03	-6.3270-03
-6.3667-03	-6.4126-03	-6.4616-03	-6.5105-03	-6.5566-03	-6.5978-03	-6.6326-03	-6.6609-03	-6.6831-03	-6.7014-03
-6.7146-03	-6.7273-03	-6.7404-03	-6.7592-03	-6.7727-03	-6.7934-03	-6.8174-03	-6.8446-03	-6.8746-03	-6.9070-03
-6.9412-03	-6.9766-03	-7.0130-03	-7.0500-03	-7.0877-03	-7.1263-03	-7.1666-03	-7.2092-03	-7.2552-03	-7.3053-03
-7.3603-03	-7.4205-03	-7.4860-03	-7.5562-03	-7.6304-03	-7.7075-03	-7.7862-03	-7.8650-03	-7.9429-03	-8.0187-03
-8.0922-03	-8.1635-03	-8.2337-03	-8.3047-03	-8.3791-03	-8.4601-03	-8.5512-03	-8.6555-03	-8.7759-03	-8.9144-03
-9.0717-03	-9.2475-03	-9.4400-03	-9.6461-03						

BLADE STATION= 3

3.5752-02	3.6202-02	3.6620-02	3.7001-02	3.7340-02	3.7651-02	3.7875-02	3.8066-02	3.8202-02	3.8280-02
3.8295-02	3.8244-02	3.8078-02	3.7926-02	3.7653-02	3.7302-02	3.6874-02	3.6376-02	3.5815-02	3.5206-02
3.4564-02	3.3908-02	3.3255-02	3.2625-02	3.2033-02	3.1490-02	3.1006-02	3.0586-02	3.0230-02	2.9935-02
2.9694-02	2.9496-02	2.9328-02	2.9173-02	2.9013-02	2.8830-02	2.8603-02	2.8319-02	2.7962-02	2.7523-02
2.6997-02	2.6385-02	2.5694-02	2.4935-02	2.4125-02	2.3285-02	2.2441-02	2.1619-02	2.0844-02	2.0141-02
1.9531-02	1.9031-02	1.8653-02	1.8401-02	1.8277-02	1.8274-02	1.8384-02	1.8592-02	1.8884-02	1.9243-02
1.9651-02	2.0092-02	2.0550-02	2.1011-02	2.1464-02	2.1899-02	2.2310-02	2.2692-02	2.3042-02	2.3359-02
2.3640-02	2.3882-02	2.4083-02	2.4239-02	2.4346-02	2.4402-02	2.4404-02	2.4355-02	2.4259-02	2.4120-02
2.3948-02	2.3754-02	2.3549-02	2.3348-02	2.3163-02	2.3009-02	2.2900-02	2.2849-02	2.2866-02	2.2959-02
2.3127-02	2.3370-02	2.3675-02	2.4031-02	2.4420-02	2.4823-02	2.5220-02	2.5594-02	2.5929-02	2.6214-02
2.6441-02	2.6609-02	2.6720-02	2.6782-02	2.6806-02	2.6809-02	2.6807-02	2.6816-02	2.6852-02	2.6926-02
2.7044-02	2.7209-02	2.7416-02	2.7660-02	2.7931-02	2.8218-02	2.8510-02	2.8796-02	2.9066-02	2.9310-02
2.9522-02	2.9695-02	2.9828-02	2.9923-02	2.9986-02	3.0024-02	3.0051-02	3.0079-02	3.0121-02	3.0191-02
3.0298-02	3.0451-02	3.0654-02	3.0909-02	3.1213-02	3.1564-02	3.1955-02	3.2380-02	3.2833-02	3.3308-02
3.3797-02	3.4294-02	3.4790-02	3.5279-02						

-3.4497-03	-3.5851-03	-3.6981-03	-3.7872-03	-3.8531-03	-3.8994-03	-3.9289-03	-3.9484-03	-3.9622-03	-3.9742-03
-3.9867-03	-4.0004-03	-4.0118-03	-4.0230-03	-4.0237-03	-4.0098-03	-3.9758-03	-3.9166-03	-3.8292-03	-3.7130-03
-3.5699-03	-3.4044-03	-3.2230-03	-3.0336-03	-2.8445-03	-2.6636-03	-2.4979-03	-2.3529-03	-2.2321-03	-2.1371-03
-2.0671-03	-2.0196-03	-1.9900-03	-1.9725-03	-1.9604-03	-1.9466-03	-1.9242-03	-1.8873-03	-1.8312-03	-1.7523-03
-1.6509-03	-1.5259-03	-1.3798-03	-1.2159-03	-1.0382-03	-8.5140-04	-6.6002-04	-4.6847-04	-2.8077-04	-1.0023-04
7.0021-05	2.2758-04	3.7013-04	4.9586-04	6.0197-04	6.8730-04	7.5027-04	7.8965-04	8.0497-04	7.9645-04
7.6530-04	7.1376-04	6.4518-04	5.6400-04	4.7559-04	3.8606-04	3.0184-04	2.2921-04	1.7395-04	1.4852-04
1.3170-04	1.4831-04	1.8901-04	2.5053-04	3.2805-04	4.1558-04	5.0663-04	5.9463-04	6.7351-04	7.3811-04
7.8454-04	8.1046-04	8.1523-04	7.9992-04	7.6701-04	7.2020-04	6.6375-04	6.0213-04	5.3931-04	4.7837-04
4.2112-04	3.6802-04	3.1824-04	2.6992-04	2.2061-04	1.6766-04	1.0868-04	4.1916-05	-3.3502-05	-1.1731-04
-2.0791-04	-3.0259-04	-3.9745-04	-4.8797-04	-5.6938-04	-6.3732-04	-6.8841-04	-7.2087-04	-7.3478-04	-7.323[illegible]-04
-7.1752-04	-6.9569-04	-6.7314-04	-6.5641-04	-6.5189-04	-6.6498-04	-7.0019-04	-7.6036-04	-8.4647-04	-9.572[illegible]-04
-1.0890-03	-1.2359-03	-1.3903-03	-1.5436-03	-1.6873-03	-1.8135-03	-1.9168-03	-1.9940-03	-2.0455-03	-2.074[illegible]-03
-2.0883-03	-2.0936-03	-2.0992-03	-2.1133-03	-2.1427-03	-2.1926-03	-2.2662-03	-2.3647-03	-2.4870-03	-2.630[illegible]-03
-2.7894-03	-2.9584-03	-3.1295-03	-3.2959-03						

BLADE STATION= 4

3.9301-02	3.9265-02	3.9196-02	3.9065-02	3.8893-02	3.8651-02	3.8462-02	3.8295-02	3.8231-02	3.8[illegible]15-02
3.8562-02	3.8968-02	3.9510-02	4.0161-02	4.0893-02	4.1687-02	4.2520-02	4.3369-02	4.4188-02	4.498[illegible]-02
4.5443-02	4.5735-02	4.5762-02	4.5547-02	4.5117-02	4.4693-02	4.4304-02	4.4123-02	4.4252-02	4.476[illegible]-02
4.5735-02	.7236-02	4.9381-02	5.2325-02	5.6189-02	6.0665-02	6.4895-02	6.8492-02	7.1603-02	7.439[illegible]-02

Figure 50. Continued.

7.6937-02	7.9277-02	8.1409-02	8.3300-02	8.4888-02	8.6100-02	8.6862-02	8.7127-02	8.6876-02	8.6154-02
8.5041-02	8.3687-02	8.2272-02	8.0994-02	7.9913-02	7.9134-02	7.8628-02	7.8364-02	7.8311-02	7.8443-02
7.8741-02	7.9184-02	7.9746-02	8.0380-02	8.1020-02	8.1585-02	8.1992-02	8.2176-02	8.2097-02	8.1750-02
8.1161-02	8.0390-02	7.9513-02	7.8620-02	7.7798-02	7.7124-02	7.6649-02	7.6398-02	7.6364-02	7.6512-02
7.6786-02	7.7120-02	7.7442-02	7.7693-02	7.7825-02	7.7818-02	7.7660-02	7.7444-02	7.7166-02	7.6912-02
7.6749-02	7.6733-02	7.6905-02	7.7281-02	7.7862-02	7.8621-02	7.9519-02	8.0493-02	8.1471-02	8.2370-02
8.3108-02	8.3609-02	8.3817-02	8.3701-02	8.3268-02	8.2560-02	8.1658-02	8.0679-02	7.9766-02	7.9071-02
7.8732-02	7.8845-02	7.9446-02	8.0506-02	8.1940-02	8.3621-02	8.5397-02	8.7103-02	8.8572-02	8.9646-02
9.0187-02	9.0086-02	8.9274-02	8.7783-02	8.5451-02	8.2513-02	7.8994-02	7.5007-02	7.0680-02	6.6161-02
6.1617-02	5.7243-02	5.3242-02	4.9767-02	4.6886-02	4.4600-02	4.2860-02	4.1590-02	4.0703-02	4.0112-02
3.9737-02	3.9514-02	3.9392-02	3.9332-02						
-1.0431-02	-1.0532-02	-1.0623-02	-1.0685-02	-1.0713-02	-1.0694-02	-1.0661-02	-1.0604-02	-1.0552-02	-1.0525-02
-1.0536-02	-1.0593-02	-1.0698-02	-1.0850-02	-1.1048-02	-1.1291-02	-1.1573-02	-1.1885-02	-1.2208-02	-1.2509-02
-1.2755-02	-1.2910-02	-1.2960-02	-1.2903-02	-1.2747-02	-1.2558-02	-1.2352-02	-1.2188-02	-1.2105-02	-1.2133-02
-1.2300-02	-1.2638-02	-1.3191-02	-1.4018-02	-1.5166-02	-1.6526-02	-1.7787-02	-1.8810-02	-1.9655-02	-2.0387-02
-2.1040-02	-2.1629-02	-2.2156-02	-2.2618-02	-2.3001-02	-2.3288-02	-2.3464-02	-2.3517-02	-2.3446-02	-2.3260-02
-2.2986-02	-2.2666-02	-2.2351-02	-2.2092-02	-2.1918-02	-2.1831-02	-2.1816-02	-2.1855-02	-2.1931-02	-2.2032-02
-2.2150-02	-2.2281-02	-2.2418-02	-2.2553-02	-2.2672-02	-2.2759-02	-2.2795-02	-2.2767-02	-2.2668-02	-2.2499-02
-2.2269-02	-2.1992-02	-2.1689-02	-2.1385-02	-2.1100-02	-2.0855-02	-2.0664-02	-2.0533-02	-2.0461-02	-2.0439-02
-2.0455-02	-2.0493-02	-2.0537-02	-2.0572-02	-2.0588-02	-2.0583-02	-2.0557-02	-2.0520-02	-2.0484-02	-2.0464-02
-2.0474-02	-2.0522-02	-2.0615-02	-2.0752-02	-2.0928-02	-2.1137-02	-2.1367-02	-2.1603-02	-2.1830-02	-2.2031-02
-2.2186-02	-2.2281-02	-2.2302-02	-2.2243-02	-2.2105-02	-2.1896-02	-2.1636-02	-2.1351-02	-2.1076-02	-2.0852-02
-2.0712-02	-2.0682-02	-2.0770-02	-2.0967-02	-2.1250-02	-2.1588-02	-2.1947-02	-2.2288-02	-2.2578-02	-2.2782-02
-2.2872-02	-2.2826-02	-2.2628-02	-2.2271-02	-2.1756-02	-2.1091-02	-2.0290-02	-1.9368-02	-1.8347-02	-1.7254-02
-1.6127-02	-1.5015-02	-1.3976-02	-1.3057-02	-1.2281-02	-1.1651-02	-1.1160-02	-1.0792-02	-1.0533-02	-1.0366-02
-1.0275-02	-1.0248-02	-1.0273-02	-1.0339-02						

BLADE STATION= 5

3.9560-02	3.9311-02	3.9250-02	3.9361-02	3.9615-02	4.0051-02	4.0689-02	4.1527-02	4.2533-02	4.3664-02
4.4862-02	4.6076-02	4.7174-02	4.8356-02	4.9342-02	5.0191-02	5.0904-02	5.1507-02	5.2035-02	5.2524-02
5.2992-02	5.3439-02	5.3849-02	5.4193-02	5.4433-02	5.4522-02	5.4395-02	5.3963-02	5.3124-02	5.1811-02
5.0305-02	4.9119-02	4.8390-02	4.8042-02	4.7968-02	4.8078-02	4.8306-02	4.8604-02	4.8942-02	4.9295-02
4.9646-02	4.9980-02	5.0282-02	5.0536-02	5.0727-02	5.0839-02	5.0859-02	5.0776-02	5.0585-02	5.0289-02
4.9897-02	4.9429-02	4.8912-02	4.8376-02	4.7859-02	4.7396-02	4.7017-02	4.6747-02	4.6597-02	4.6569-02
4.6652-02	4.6829-02	4.7075-02	4.7364-02	4.7666-02	4.7949-02	4.8187-02	4.8356-02	4.8437-02	4.8423-02
4.8315-02	4.8125-02	4.7874-02	4.7587-02	4.7292-02	4.7017-02	4.6786-02	4.6614-02	4.6512-02	4.6481-02
4.6517-02	4.6608-02	4.6737-02	4.6885-02	4.7029-02	4.7149-02	4.7228-02	4.7256-02	4.7231-02	4.7158-02
4.7049-02	4.6924-02	4.6804-02	4.6713-02	4.6673-02	4.6700-02	4.6807-02	4.6994-02	4.7254-02	4.7570-02
4.7917-02	4.8264-02	4.8583-02	4.8845-02	4.9030-02	4.9126-02	4.9130-02	4.9052-02	4.8912-02	4.8735-02
4.8555-02	4.8405-02	4.8317-02	4.8316-02	4.8418-02	4.8628-02	4.8935-02	4.9315-02	4.9736-02	5.0154-02
5.0525-02	5.0806-02	5.0959-02	5.0955-02	5.0776-02	5.0416-02	4.9889-02	4.9233-02	4.8504-02	4.7779-02
4.7148-02	4.6709-02	4.6547-02	4.6697-02	4.7049-02	4.7222-02	4.6837-02	4.5995-02	4.4913-02	4.3753-02
4.2626-02	4.1601-02	4.0727-02	4.0036-02						
-9.5448-03	-9.6403-03	-9.7905-03	-9.9762-03	-1.0189-02	-1.0427-02	-1.0691-02	-1.0973-02	-1.1266-02	-1.1556-02
-1.1831-02	-1.2082-02	-1.2314-02	-1.2480-02	-1.2621-02	-1.2725-02	-1.2802-02	-1.2865-02	-1.2928-02	-1.3003-02
-1.3091-02	-1.3188-02	-1.3280-02	-1.3348-02	-1.3372-02	-1.3328-02	-1.3185-02	-1.2938-02	-1.2457-02	-1.1813-02
-1.1077-02	-1.0436-02	-9.9446-03	-9.5840-03	-9.3232-03	-9.1355-03	-9.0010-03	-8.9055-03	-8.8394-03	-8.7954-03
-8.7679-03	-8.7522-03	-8.7443-03	-8.7404-03	-8.7369-03	-8.7309-03	-8.7198-03	-8.7022-03	-8.6774-03	-8.6460-03
-8.6096-03	-8.5716-03	-8.5351-03	-8.5043-03	-8.4831-03	-8.4745-03	-8.4801-03	-8.4992-03	-8.5293-03	-8.5662-03
-8.6045-03	-8.6395-03	-8.6670-03	-8.6847-03	-8.6913-03	-8.6867-03	-8.6713-03	-8.6463-03	-8.6133-03	-8.5746-03
-8.5329-03	-8.4914-03	-8.4529-03	-8.4203-03	-8.3952-03	-8.3783-03	-8.3691-03	-8.3660-03	-8.3671-03	-8.3703-03
-8.3735-03	-8.3752-03	-8.3743-03	-8.3697-03	-8.3608-03	-8.3468-03	-8.3276-03	-8.3039-03	-8.2738-03	-8.2407-03
-8.2046-03	-8.1667-03	-8.1284-03	-8.0911-03	-8.0563-03	-8.0254-03	-7.9996-03	-7.9798-03	-7.9657-03	-7.9563-03
-7.9498-03	-7.9438-03	-7.9358-03	-7.9237-03	-7.9059-03	-7.8814-03	-7.8501-03	-7.8125-03	-7.7701-03	-7.7248-03
-7.6793-03	-7.6367-03	-7.5999-03	-7.5719-03	-7.5548-03	-7.5496-03	-7.5561-03	-7.5728-03	-7.5974-03	-7.6271-03
-7.6592-03	-7.6916-03	-7.7227-03	-7.7524-03	-7.7813-03	-7.8119-03	-7.8489-03	-7.8998-03	-7.9757-03	-8.0909-03
-8.2629-03	-8.5107-03	-8.8502-03	-9.2814-03	-9.7583-03	-1.0143-02	-1.0305-02	-1.0281-02	-1.0150-02	-9.9763-03
-9.8018-03	-9.6559-03	-9.5569-03	-9.5193-03						

UTRAP VALUES FOR FIELD POINT 1

-5.641257-05 -1.40[illegible]35-06

Figure 50. Continued.

```
VTRAP VALUES FOR FIELD POINT  1
-2.921837-05 -2.318169-05

UTRAP VALUES FOR FIELD POINT  2
-5.002590-05 -4.133724-06

VTRAP VALUES FOR FIELD POINT  2
-1.234774-05 -1.255837-06


PRESSURES AT FIELD POINT   1

-5.832056-05 -6.924993-05 -7.782530-05 -8.338473-05 -8.544820-05 -8.376291-05 -7.832926-05 -6.940456-05 -5.748518-05 -4.326673-05
-2.758798-05 -1.136242-05  4.495752-06  1.914439-05  3.187825-05  4.218005-05  4.975313-05  5.453300-05  5.667713-05  5.653421-05
 5.459650-05  5.144008-05  4.765908-05  4.380079-05  4.030783-05  3.747337-05  3.541367-05  3.406073-05  3.317545-05  3.238012-05
 3.120662-05  2.915549-05  2.575972-05  2.064667-05  1.359171-05  4.557872-06 -6.282740-06 -1.854834-05 -3.166813-05 -4.492261-05
-5.750003-05


PRESSURES AT FIELD POINT   2

-5.415962-05 -5.565995-05 -5.547906-05 -5.363859-05 -5.022999-05 -4.540777-05 -3.937879-05 -3.238854-05 -2.470560-05 -1.660561-05
-8.355976-06 -2.026120-07  7.640309-06  1.499701-05  2.173278-05  2.775282-05  3.299771-05  3.743620-05  4.105654-05  4.385722-05
 4.583854-05  4.699585-05  4.731536-05  4.677310-05  4.533700-05  4.297221-05  3.964869-05  3.535060-05  3.008619-05  2.389704-05
 1.686563-05  9.120068-06  8.352629-07 -7.769854-06 -1.643925-05 -2.489044-05 -3.282823-05 -3.996053-05 -4.601500-05 -5.075524-05
-5.399515-05


                         ROTATIONAL NOISE PROGRAM E676

HARMONIC =  1
                                                              SOUND PRESSURE LEVEL
 FIELD           FIELD POINT COORDINATES (IN)                       DECIBELS
 POINT          X             Y             Z
                                                                    8.3801+01
   1        5.5960+03      0.0000       -3.2310+03                  8.1982+01
   2        6.4380+03      0.0000       -5.6300+02

HARMONIC =  2
                                                              SOUND PRESSURE LEVEL
 FIELD           FIELD POINT COORDINATES (IN)                       DECIBELS
 POINT          X             Y             Z
                                                                    7.5074+01
   1        5.5960+03      0.0000       -3.2310+03                  6.0452+01
   2        6.4380+03      0.0000       -5.6300+02
```

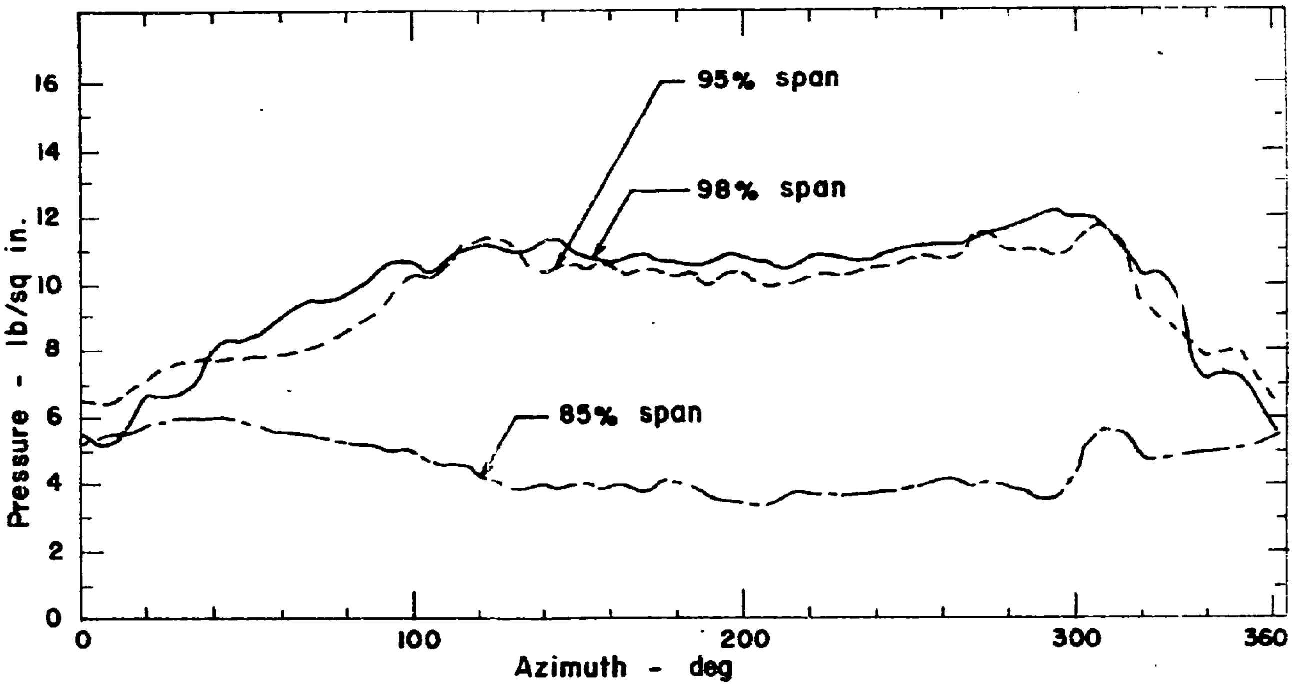
Figure 50. Concluded.

APPENDIX II
MEASURED AERODYNAMIC DATA

Figures 51 and 52 compare the azimuthal histories of differential pressure on a CH-53A main rotor blade for hover conditions with and without RIN. Pressures at 85% span do not show rapid fluctuations associated with blade/wake interaction RIN. However, pressures at 95% and 98% span do reflect the blade/wake interactions for the RIN condition. Traces for 75% and 40% span are not presented since they are as inactive as those at 85% span.

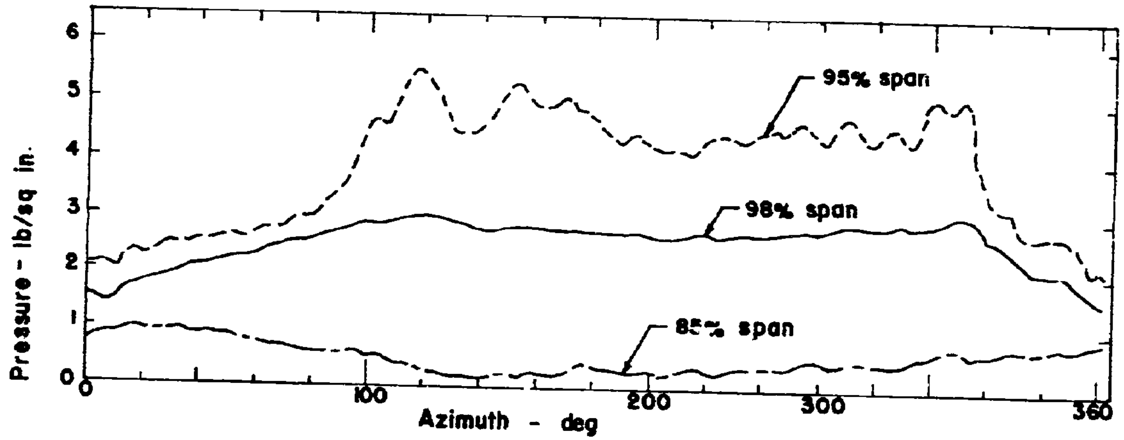
Measured aerodynamic data are presented in Tables II through X. These tables contain blade angulator and differential pressure data in harmonic form for a positive series $(A(\psi) = A_o + A_1 \cos\psi + B_1 \sin\psi + \ldots + A_n \cos n\psi + B_n \sin n\psi)$. Angulator data are in units of degrees while differential pressure data are in units of pounds per square inch. Harmonics of pressure are read line-by-line from left to right for each spanwise and chordwise location. Note that the pressures for Span 1, Chord 4 (.4 span, .6 chord) are zero because of an inoperative transducer. Adverse effects of losing these data are negligible for the present study, because this inboard portion of the blade does not control the acoustic characteristics of the blade. Table XI contains trim parameters for each flight condition. Shaft inclination is referenced to vertical and is defined as positive for aft inclination (normal autogyro sign convention).

Differential pressure data recorded on the airborne direct system were analyzed to determine if more than 30 harmonics were present. Spectrum averaging with real-time analysis equipment revealed no more than 30 significant harmonics for the flight conditions of the present study. Since rotational noise levels were calculated from 30 loading harmonics, the present study made full use of the data's potential for rotational noise prediction.

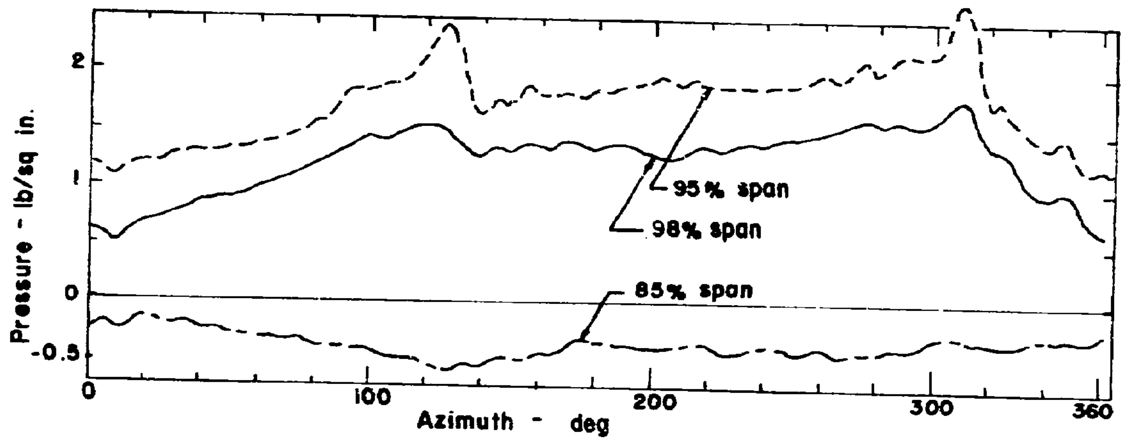


a. 4% Chord Station (Leading Edge)

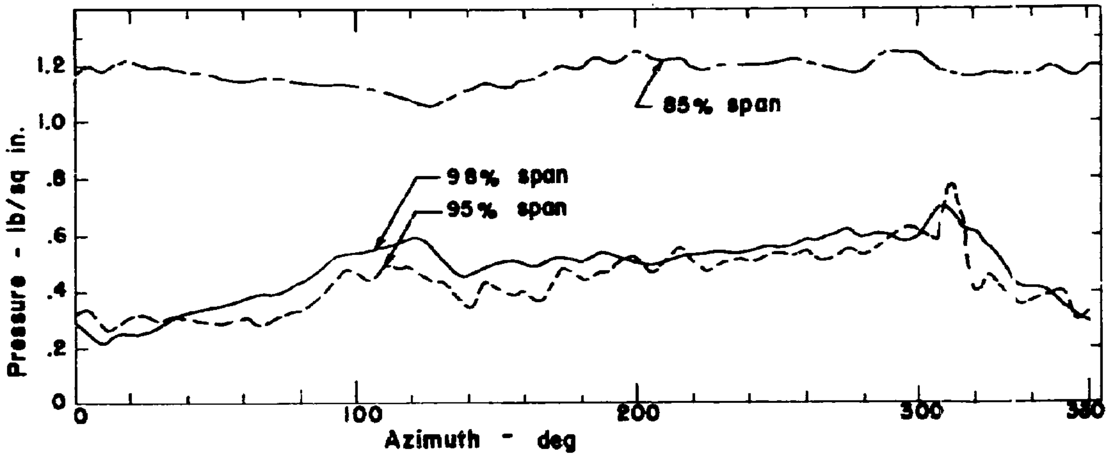
Figure 51. Differential Blade Pressures - Hover Without RIN.



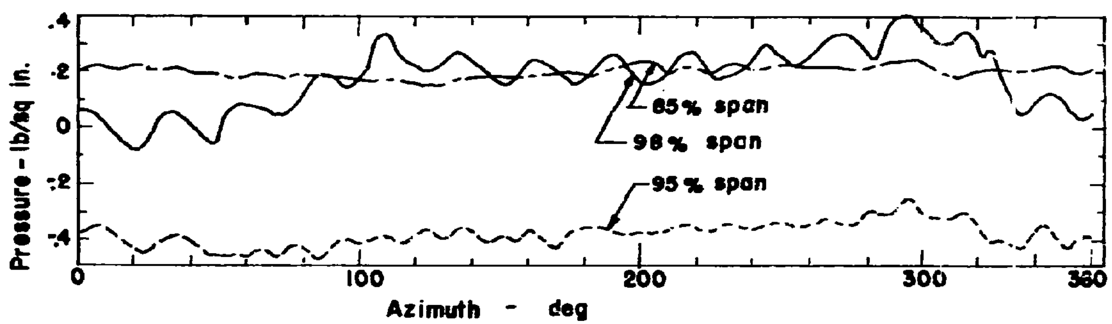
b. 15% Chord Station



c. 30% Chord Station
Figure 51. Continued.

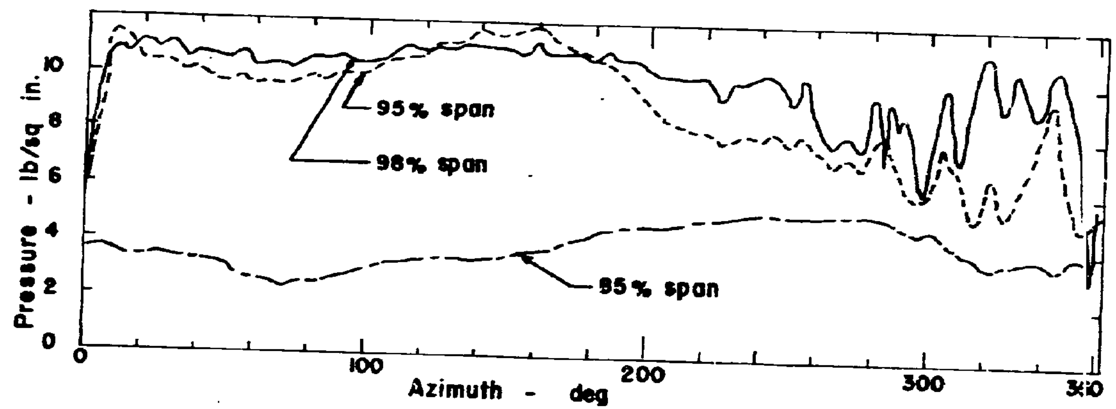


d. 60% Chord Station

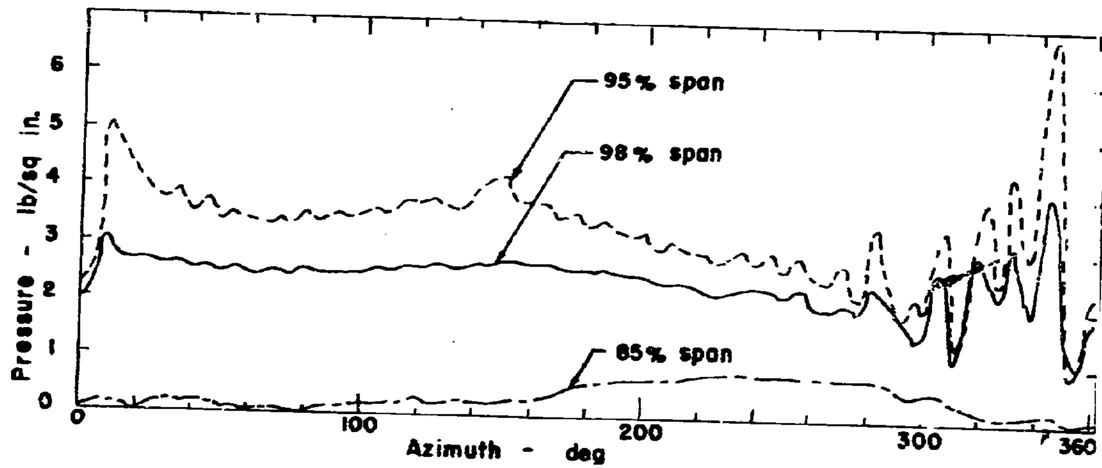


e. 91% Chord Station (Trailing Edge)

Figure 51. Concluded.

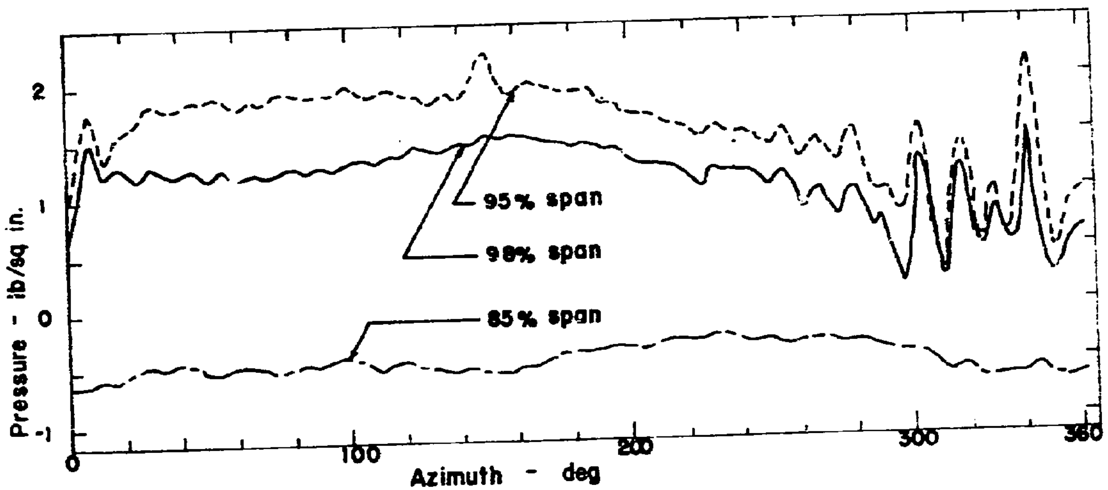


a. 4% Chord Station (Leading Edge)

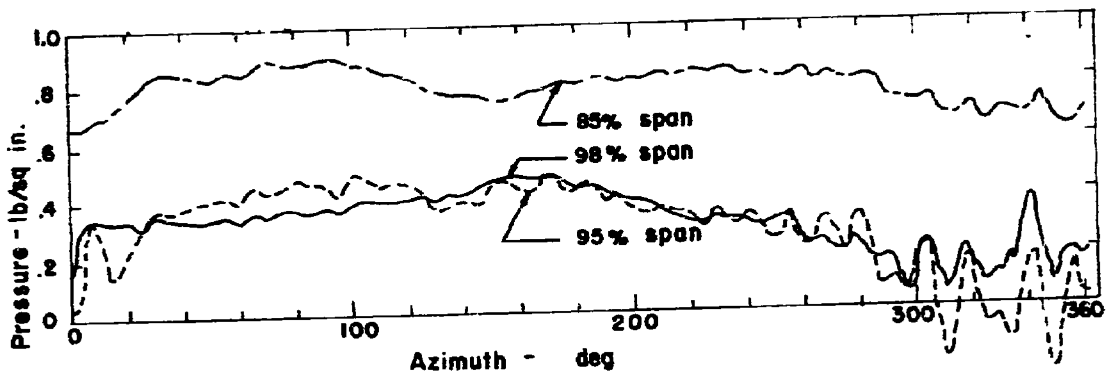


b. 15% Chord Station

Figure 52. Differential Blade Pressures - Hover With RIN.

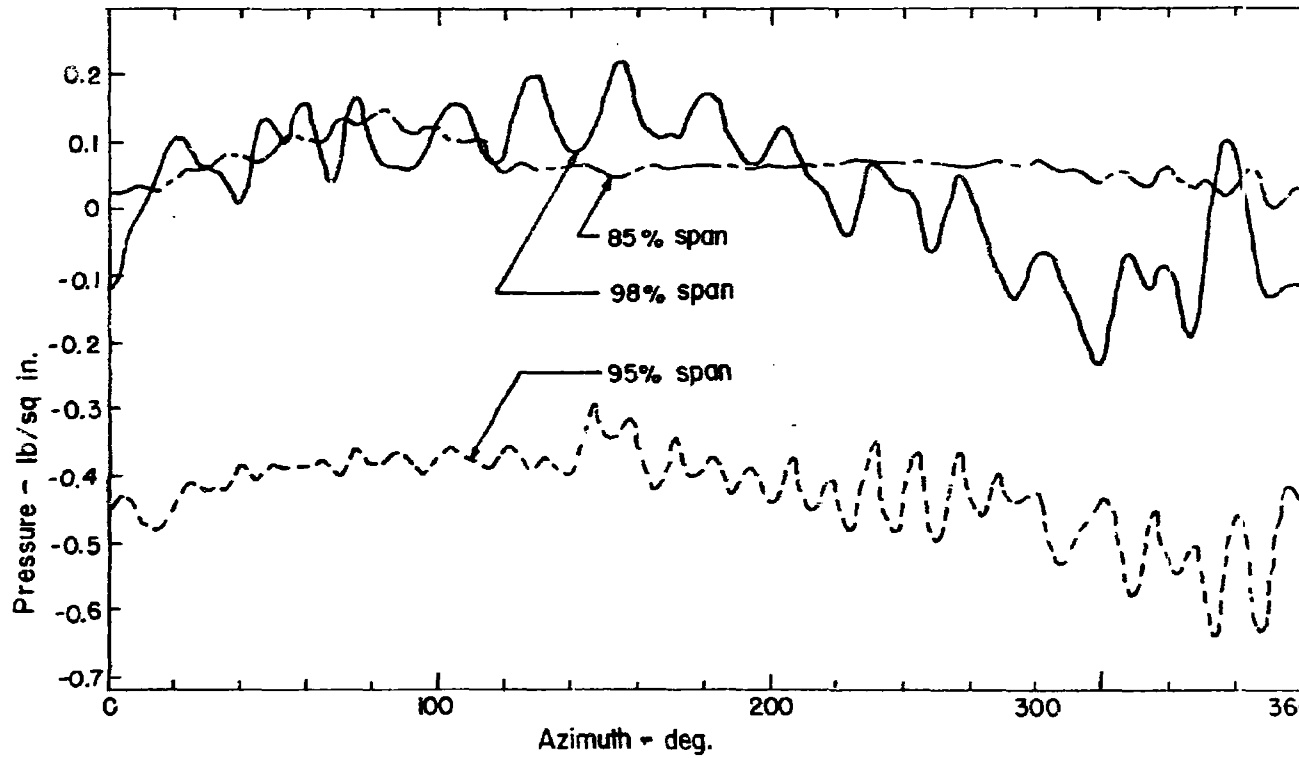


c. 30% Chord Station



d. 60% Chord Station

Figure 52. Continued.



e. 91% Chord Station (Trailing Edge)

Figure 52. Concluded.

TABLE II. AERODYNAMIC DATA - HOVER, NO RIN, 030° HEADING

```
BURST NO. #  7              *** ROTOR NOISE PUNCHED OUTPUT ***
BLADE PITCH HARMONICS
 1.3133E01 1.2684E00 1.4096E00  *COLLECTIVE, LONGITUDINAL, LATERAL RESPECTIVELY*
ROTOR FLAPPING ANGLE HARMONICS
 3.4965E00-9.2093-01 0.0000     *POSITIVE TAIL HIGH -- DEGREES*
DIFFERENTIAL PRESSURE HARMONICS FOR 5 CHORD STATIONS AT EACH OF THE 5 SPANS
*MEASURING FROM THE LEADING EDGE AND THE BLADE ROOT RESPECTIVELY*.
SPAN 1  CHORD 1           STEADY#  1.3215E00
COSINE COEFFICIENTS
 1.7893-01 8.6379-02-9.1522-02 5.4074-02-1.4760-02 1.3734-02-3.2843-03 6.8900-03
-1.9970-03-3.4915-03 8.4930-04-1.1290-03-6.9497-03 3.9449-03-9.0343-04 4.3004-03
 4.3959-03 3.0881-04 9.1279-03-5.5478-03-4.8316-05 4.9040-03 3.4661-03-3.2388-03
-1.5023-03-4.7401-03 4.2240-03-1.9447-03-2.2745-03-9.3408-03
SINE COEFFICIENTS
 2.5822-01 1.2173-01-7.8300-02 1.6145-02-2.9130-02 2.6313-02-8.1456-03 1.4022-02
 4.4771-05 8.4027-03 9.5388-03 1.0633-02 5.3334-03 2.9976-03 2.5466-03 8.0187-03
-3.6435-03 2.5755-03-5.3787-03-4.4364-03 3.3528-03 3.4018-03 6.9199-03 5.5968-03
-1.0017-02 9.9794-05-1.6761-03 1.0711-02 1.4144-03 2.0408-03
SPAN 1  CHORD 2           STEADY#  5.2611-01
COSINE COEFFICIENTS
 6.3769-02 2.6989-02-2.6319-02 2.2534-02-1.1330-02 2.8795-03-8.5509-04 4.2238-03
 3.1026-03 1.9779-03 3.8844-03-1.8980-03 2.1659-03-3.2059-04 3.5903-04-2.8702-03
 3.9076-04-5.7715-03-1.1922-02 4.5250-03 6.7258-03 1.7215-03 3.4697-03-2.3070-03
 2.7648-03-4.0455-03-4.0322-03-1.3050-03-8.7565-03 2.6422-02
SINE COEFFICIENTS
 1.0326-01 8.1014-02-2.4542-02 7.6643-03-4.6196-03 8.0601-03 7.9350-03 7.4742-03
-3.5750-03-2.0922-03-1.5032-04 2.7277-03-1.3113-03 2.4368-03 6.6702-05 4.5762-04
 9.8543-04-3.2046-03-4.5313-03 2.1323-03 1.8519-04 1.0419-03 2.1888-03-3.3102-03
-4.5418-03 7.5371-03-4.1295-03-1.2611-03-5.6943-03 9.7307-03
SPAN 1  CHORD 3           STEADY#  2.7584-01
COSINE COEFFICIENTS
 5.3880-02 2.8974-02-2.9560-02 9.6782-03-6.2573-03 3.0683-03 1.4864-03 3.5357-03
-2.6590-03-4.1112-04 3.7660-03 1.8135-03-4.6702-04 9.3446-04 8.9288-04 3.0574-04
 1.1809-03 1.0868-03-7.3116-04-8.6081-04 1.6214-03 9.3992-04-1.5457-03 3.1568-03
 2.9810-04-1.9213-03 3.3486-03-3.8306-03 4.5115-04-3.0356-03
SINE COEFFICIENTS
 7.3465-02 3.2867-02-1.2936-02 5.3314-03-6.4602-03 6.6668-03-7.8706-04 3.6909-03
 1.5718-03 3.2335-03 2.2136-03 2.8958-04 1.9336-03-1.3150-03-7.5293-04 7.0550-04
-1.6301-03 1.3701-03-5.9663-03 3.8544-03 2.8686-03 2.3121-03 1.0317-03 2.3985-03
-6.7346-04-2.8555-05 1.8868-03 1.9076-03-6.0112-04-5.8683-04
SPAN 1  CHORD 4           STEADY#  0.0000
COSINE COEFFICIENTS
  0.0000    0.0000    0.0000    0.0000    0.0000    0.0000    0.0000    0.0000
  0.0000    0.0000    0.0000    0.0000    0.0000    0.0000    0.0000    0.0000
  0.0000    0.0000    0.0000    0.0000    0.0000    0.0000    0.0000    0.0000
  0.0000    0.0000    0.0000    0.0000    0.0000    0.0000
SINE COEFFICIENTS
  0.0000    0.0000    0.0000    0.0000    0.0000    0.0000    0.0000    0.0000
  0.0000    0.0000    0.0000    0.0000    0.0000    0.0000    0.0000    0.0000
  0.0000    0.0000    0.0000    0.0000    0.0000    0.0000    0.0000    0.0000
  0.0000    0.0000    0.0000    0.0000    0.0000    0.0000
SPAN 1  CHORD 5           STEADY# -5.6346-02
COSINE COEFFICIENTS
-9.4211-03-4.8721-03 3.1423-03-3.3696-04-2.9359-05 4.4270-04-2.7112-04-9.1695-04
 2.6616-04 3.1085-04 3.8000-04 1.8462-04-2.0502-04 6.7544-04 8.3109-04 5.1657-05
 7.5813-04-1.6474-04 7.6090-04-3.0417-04 2.1672-04-1.2764-04-4.5281-04 8.5783-04
-1.8388-05 3.2837-04-7.3904-04-4.1605-04-7.0243-04-3.7858-04
SINE COEFFICIENTS
-8.4587-04-4.6024-03 8.6588-05-1.6911-03 2.1953-03-3.2855-04 1.5774-04-2.6268-04
-4.8398-04 1.0617-04-2.8801-04 9.0521-04-2.2690-04-3.8574-05-6.9851-04 1.5426-04
-7.2141-05 3.9775-04 1.1860-03-7.9125-04 4.8384-05-2.3796-05-6.4754-05-1.0166-03
-6.9057-04-4.8320-04 1.0969-04-1.3911-04 3.3358-05 2.6347-06
```

TABLE II - Continued

```
SPAN 2  CHORD 1        STEADY#  3.5155800
COSINE COEFFICIENTS
 6.2205-01-5.0632-02 1.4693-02 3.2436-02-6.0388-02 2.5522-02-1.7416-03-5.5072-03
 1.1860-02-5.4898-03 1.8868-02 1.7013-03-7.0031-03 8.4306-03 9.0738-03 8.9960-03
-4.0411-03 9.4131-04 1.1452-03 2.6997-03 5.8287-03-4.9967-03-5.5136-04-1.7133-03
-2.1006-03-7.3604-03 2.2492-03 9.8086-04 2.3835-03 8.7400-03
SINE COEFFICIENTS
 6.[illegible]991-01 1.7020-01 3.8880-02 8.0048-02 3.4875-03 1.5879-02 1.3939-02-4.9721-04
 1.6311-02 2.5767-02 8.5079-03 9.2934-03 1.9989-02 9.6852-03 1.4059-02-3.3363-03
-2.1918-03 5.0861-03-8.8771-05-1.7950-04 2.1624-03 [illegible].1806-02-8.9021-03 1.3144-02
 5.8140-03 1.3763-02 1.2142-02 6.0306-03-6.0559-03 5.8436-03
SPAN 2  CHORD 2        STEADY#  1.4074800
COSINE COEFFICIENTS
 2.9125-01-1.4134-03 6.7889-03 2.1101-02-3.0086-02 1.3803-02-5.0205-03-1.6058-03
 2.7946-03-2.0997-03 7.8461-03 4.9558-03-5.5405-03 4.1930-03 4.0955-03 2.5070-03
-6.9420-03-2.9400-03-1.0118-02 6.1578-03 4.7728-04-6.7487-04 2.1611-03-5.0470-03
-1.3996-03 4.3807-04 4.5519-03-2.5978-04 3.1004-03 2.7694-03
SINE COEFFICIENTS
 2.4252-01 7.7975-02 1.6632-02 3.2862-02 1.3079-02 7.4412-03 7.4750-03 5.3284-03
 5.5524-03 1.2052-02 1.4467-05 1.3798-03 1.0131-02-2.3284-03-1.9046-03 1.5630-03
-3.8372-03-1.6881-03 6.2252-03 5.1712-04-1.6817-03-4.6572-04-2.4231-03 7.6810-03
 2.5987-03 4.7418-03-7.1681-04-2.7080-03 2.1766-03-1.8385-03
SPAN 2  CHORD 3        STEADY#  1.1239800
COSINE COEFFICIENTS
 1.4021-01-2.5537-02 7.3251-04 1.2601-02-1.5888-02 6.8869-03 1.0343-04 2.9860-03
 3.7106-03-6.3201-04-3.2924-04 3.6240-04-3.2937-03 9.1033-04 3.8301-03-6.1639-04
-3.1995-03 8.7501-04 4.1110-04 4.6413-03-1.1904-03 2.5720-03-7.0616-04-2.6867-03
 1.2705-03-1.1158-03 1.6909-03-1.7204-03-1.7354-03-3.6505-03
SINE COEFFICIENTS
 1.4063-01 3.6232-02 7.2472-03 2.2703-02-3.6062-04 7.2413-03 3.5772-03-4.5975-04
 1.8374-03 5.7147-03-1.3828-03 4.9614-04 1.289[illegible]-03 1.0870-03-2.1114-03-5.3780-04
 1.2634-03-1.6645-03 1.5366-03-1.5986-03 8.5367-04 7.2630-04-3.3847-03 5.8619-03
 3.6215-03 3.6907-03 6.9162-04-1.6133-03 4.1089-04 1.5620-03
SPAN 2  CHORD 4        STEADY#  2.7872-01
COSINE COEFFICIENTS
 8.4155-02 2.6385-03-2.0558-03 9.6918-03-8.3669-03 9.2523-04-7.9473-04-2.9648-03
 2.1314-03 7.2286-05 9.2409-04 7.9965-04-4.6974-04-1.9052-04 1.5216-03-5.9636-04
 5.1233-05-1.0101-03-3.6540-04-2.8228-04 1.5125-04 4.4250-04 8.4629-05-5.1707-04
-6.2209-04-5.2277-04 2.1462-03-6.2797-04-1.0745-03 7.7548-05
SINE COEFFICIENTS
 4.7117-02 2.0689-02 6.5795-03 5.4138-03 1.1244-02 4.4744-03 3.3201-03-6.1514-04
-1.4586-04 4.0916-03 6.4142-04 2.3465-03 2.4332-03-2.6687-04-1.2663-03 2.1077-04
 6.9879-04 3.8897-04 9.3088-04-7.3644-04-1.0069-03-3.6329-04 6.1305-04 1.5469-03
-6.7162-04 4.8457-04 9.6107-04 8.8164-04-1.4996-04 4.8214-04
SPAN 2  CHORD 5        STEADY# -1.6337-01
COSINE COEFFICIENTS
 2.6125-02 3.8526-03-1.3509-03 3.7271-03-2.7216-03 6.2719-04 6.4998-04-1.5116-03
 1.6085-04 2.4534-04-1.1709-03 1.2073-03 8.1225-04 5.0774-04 1.1509-04 8.8855-05
 7.6715-04 1.3301-03 1.1530-03-4.4466-04-5.9289-04-9.0354-04 4.8799-06 1.4151-03
 3.8776-04 1.3138-04 1.4145-03 3.0636-04-5.7415-04-1.0304-04
SINE COEFFICIENTS
-1.3585-02 8.4238-03-3.3623-03-1.4518-03 4.5007-03 2.1445-04 1.2701-03 4.2440-04
 3.5165-04 1.9229-04 2.1429-04 1.0522-03 8.4828-04 1.9464-04 2.1339-05 4.8124-04
 4.7610-04 3.2276-04 3.1395-04-1.9230-03-3.4524-04 1.9437-04 1.0141-03 7.6594-04
 1.3039-04 2.5523-04-6.4601-04 3.8514-04-1.1134-03-1.1669-04
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TABLE II - Continued

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SPAN 3  CHORD 1        STEADY=  4.5398+00
COSINE COEFFICIENTS
 9.1344-01 2.4672-02-9.5280-02-6.1585-02-1.5801-01 5.5692-03 9.4039-02 1.1364-01
-4.8008-02-4.4187-02-1.0871-01 5.4083-03 3.5277-02 5.6363-02 3.1177-02-1.9043-02
-3.2661-02 5.0311-03-5.9869-03 8.5206-03-5.8866-03 5.6496-03-5.7473-03 2.2078-03
 1.2413-02 8.1592-03-1.4068-02-2.7078-02 1.3375-02-3.6504-03
SINE COEFFICIENTS
 6.0212-01 1.9442-01 1.7576-02-4.8439-03 1.3575-01 7.2371-02 6.9967-02-6.1871-02
-1.1948-01-1.6037-02 1.3864-02 8.4033-02 4.5553-02-9.9201-03-3.3830-02-2.5898-02
 6.4035-03 1.6180-02 2.1443-02-2.3009-03 8.4952-03 4.9311-03 7.0763-03 3.9102-03
 6.2789-03-7.0755-03 1.4883-02-2.2117-02 4.3998-02-9.5085-03
SPAN 3  CHORD 2        STEADY=  5.1488-01
COSINE COEFFICIENTS
 3.1920-01 3.6656-02-2.4089-02 3.2477-02-4.0168-02 3.1908-03 1.3488-02 9.5870-03
-1.6324-02-3.4432-03-3.2245-03 7.5349-03-2.9376-04 3.7356-03-3.6568-04-7.1000-03
-3.0104-04 3.2427-03-8.8079-03 5.6712-03-3.0231-03 7.6622-03-2.1359-03-1.7513-03
 6.3915-03-4.0997-03 2.4094-03-2.3917-03 1.5254-03-2.8373-03
SINE COEFFICIENTS
 6.9666-02 9.5417-02 9.9914-03 1.6957-02 2.9003-02-2.0850-03 3.1961-03-3.1983-03
-7.5608-03 5.5986-03 5.1504-03 1.9627-03 1.2282-03-9.4530-03-7.3499-03-5.3253-03
 1.0441-02-8.2811-03 8.2889-03 3.2551-03 4.7143-03-2.1886-03 1.8540-03 8.0500-03
 4.7956-03-1.1204-02 9.5085-03-6.1570-03-9.8546-03-7.0809-03
SPAN 3  CHORD 3        STEADY= -3.7077-01
COSINE COEFFICIENTS
 9.4995-02 5.2003-02-2.9669-02 1.2778-02-1.2519-02 9.4363-04 5.9984-03-1.5821-03
-1.3751-02 2.7460-03-9.6099-03 3.0029-03 2.3433-03-7.1157-04 5.1523-03-4.7482-03
-1.8145-03 3.7707-03 4.8344-03 1.5368-03-2.4066-04 6.8858-04-8.6469-04 2.6589-03
 8.2060-03-4.2631-03-1.5364-03-4.6039-04 4.0766-03-1.7138-04
SINE COEFFICIENTS
-2.2669-03 6.2634-02-2.6832-03 1.3001-02 2.2155-02 4.6875-03-4.3110-03-6.0489-03
-8.8835-04-2.6791-03 7.1113-03 6.8703-04 4.5805-03-2.0644-03-2.1633-03 2.8066-04
 9.0530-03-3.8696-03 5.4391-04 3.5017-03 2.4168-03 3.1966-03 6.6476-03 6.1629-03
 5.6723-03-2.5686-03 4.2196-04 3.3113-03-4.0813-03 4.5622-03
SPAN 3  CHORD 4        STEADY=  1.1764+00
COSINE COEFFICIENTS
 5.5060-03 1.5338-02-1.7025-02 1.1994-02-3.1227-04-1.0326-04 1.0875-03-8.7683-03
-5.5866-03 3.8759-03 2.8888-03 1.0275-04-2.5925-03-3.2028-03 5.4465-04-1.1663-03
 4.5118-04-2.3452-04-5.0419-04 3.2957-03-3.2744-04 6.5977-04 2.6995-03 9.0911-04
 5.0434-03-2.9738-03 1.5306-03-1.2794-03 2.0087-03-8.1781-04
SINE COEFFICIENTS
-3.8908-02 2.8985-02-2.4007-04 1.0648-02 6.8600-03 8.6288-04-9.1648-03-7.1324-05
 2.9426-03 2.9361-03 4.7852-03-5.6146-03 1.7945-03-2.8448-04-4.2911-04 1.0654-03
 1.8981-03-1.0507-04 1.6196-03 1.7150-03-1.1110-03 2.9154-03 5.4937-04 2.4146-03
 8.6896-05 5.9057-04 1.2109-03 1.0767-03-2.2987-04 6.3612-04
SPAN 3  CHORD 5        STEADY=  2.0242-01
COSINE COEFFICIENTS
 3.1762-03 4.9851-03-2.5603-03 5.8589-03 2.8196-03-4.5628-04-2.1767-04-5.9044-03
-6.3671-04 3.5209-04 3.9482-03-7.8798-04-6.8180-04-2.5325-03-8.7711-04 6.7480-04
 5.6727-04 2.5505-04 5.9795-04 6.5134-04-8.1177-04-4.7351-04 3.0004-03-1.1878-03
 1.5512-03-1.9229-03-1.4143-03 7.6162-04-1.1564-03 1.8107-03
SINE COEFFICIENTS
-2.3438-02 9.5578-03 9.9387-04 3.4870-03 9.5972-04 7.8844-04-6.8262-03 9.5167-04
 1.6353-03 2.9658-03 1.9493-03-4.6311-03 1.4959-03-4.4600-04 1.9675-03 9.7045-04
 1.7314-03-6.6614-05 1.7845-03 8.4139-06-2.0118-03 3.1844-03-1.9083-04 1.3417-03
 3.5526-04-2.1735-03 1.6984-03-3.8924-04 6.3088-04-7.8175-04
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TABLE II - Continued

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SPAN 4  CHORD 1          STEADY#  9.5341800
COSINE COEFFICIENTS
-1.3684800-8.4312-01-1.9837-01-2.4799 01-1.9390-01 7.3308-02 4.8595-02 5.4914-03
-6.6775-03-1.4721-01-9.0591-02-9.1341-03 1.8089-03 5.0508-02-2.2830-03-3.1198-02
-5.2273-02-3.0054-02-3.8927-02 2.2098-03 1.5133-02 1.5908-02-2.1017-02-2.2794-03
 2.5028-02 4.2023-05-9.7581-03-1.3757-02 1.6881-02 1.0201-02
SINE COEFFICIENTS
-7.3405-01-8.1310-01 9.9605-02 2.6595-01 4.6046-02 4.8517-04-8.7989-03-1.4977-01
-1.6010-01-8.3455-02-5.0482-02 7.5381-02 1.4215-02-9.5309-02-1.0773-02-5.3507-02
-2.5210-02-8.2992-03 6.2344-02 5.8983-02-2.9136-02 5.1984-03 3.8143-02 1.8088-02
-2.7920-02 3.3486-02-1.0842-02 3.6688-02-2.8224-03 3.8492-02
SPAN 4  CHORD 2          STEADY#  3.8796800
COSINE COEFFICIENTS
-1.1079800-3.8811-01-6.3380-02-1.2579-01-1.7367-01 1.2701-01 1.3918-01-4.6663-02
 9.8304-03-5.3028-02-9.8897-02 2.0301-02-1.3747-02 4.3704-04 3.1276-02-2.2334-02
-7.8128-03-6.2278-03-9.8328-03-2.7295-02 1.2925-02-3.8420-03 4.8009-03 6.4983-02
 9.5580-03-1.1926-02-3.5742-02-3.5270-03 1.4664-02 3.2219-03
SINE COEFFICIENTS
-3.5022-01-6.0494-01 1.0944-01 1.7018-01 1.4051-01-6.0592-02 6.5529-02-8.6124-02
-1.4504-01 1.5192-02-1.9686-02 2.0229-02 7.3208-02-7.0087-02 3.4363-02-1.2989-02
-2.7187-02-7.3026-03 3.1731-02 2.4635-03-1.0559-02 3.6536-02 3.3797-02-4.8835-03
-4.1087-02 1.9825-03-8.5268-04 1.6166-02 2.3482-02 4.6819-02
SPAN 4  CHORD 3          STEADY#  1.7704800
COSINE COEFFICIENTS
-2.6249-01-1.9883-01-5.1591-02-7.2592-02-3.6821-02 4.2362-02 1.6471-02 1.0313-02
 2.2379-02-6.7883-02-8.9710-03-1.4320-03-2.2842-02 2.8183-02 7.1747-03-1.3095-02
-3.8257-03-2.8890-02-1.6426-02 2.2795-02 1.2125-02 1.7684-02 7.2674-03-1.1140-02
 7.3705-03-1.2288-02-4.9375-03 1.8689-02 1.6197-04 1.8488-02
SINE COEFFICIENTS
-1.9704-01-2.0230-01-4.3912-02 1.1520-01 1.1838-02 1.8821-02 9.7173-03-6.5188-02
-1.3810-02-9.9860-03-3.1193-02 4.4519-02 1.1462-02-1.0973-02 5.3716-03-2.8734-02
-1.2845-02 1.3334-02 3.0942-03 2.9604-02 1.8697-02-2.0232-02-3.1933-03 2.3911-03
 1.1915-03 9.1756-03 2.9021-03 1.9768-02 6.9495-03-1.1946-02
SPAN 4  CHORD 4          STEADY#  4.3502-01
COSINE COEFFICIENTS
-4.8628-02-4.7619-02-1.2670-02-7.7182-03-1.3397-02 1.3703-02 1.8237-02 1.3705-03
-2.1859-03-3.1607-03-9.6090-03 1.9575-03-3.3055-03 1.2500-03 1.1314-02-5.6686-04
 1.6763-03-1.0080-02-6.8390-03 1.0183-03-2.5432-03 1.2895-02 4.7617-03-3.2997-03
 3.3472-03-1.1393-02-1.7096-03-7.6077-03 7.5587-03 7.1984-03
SINE COEFFICIENTS
-9.6418-02-4.2627-02-2.2180-02 4.0290-02 1.2906-02 3.3787-04-7.7343-03-1.2327-02
-9.5932-03-6.4330-03-6.8807-03 4.0859-03 9.2643-03-2.6250-03 3.8312-03-8.9611-03
-5.0431-04-9.8795-03 1.0879-02 1.6004-02 1.1777-02 4.4553-03-2.1780-03-5.2995-03
-2.7080-03-2.3385-03 5.2847-03 1.0298-02 2.0439-05 5.0925-03
SPAN 4  CHORD 5          STEADY# -3.7936-01
COSINE COEFFICIENTS
-8.4917-03-8.8517-03 9.6144-05-9.2092-04 6.0998-03 9.5912-03 2.2058-03 1.9945-03
-8.8767-04 3.4331-03 1.3717-03-2.5022-03-6.7829-03-2.8007-03-3.5518-03 1.2209-03
-1.9448-03 9.3594-03 2.9051-04 6.1218-04-2.6776-03 4.4277-03 7.1966-03 2.0035-03
-5.1467-03-3.7851-04 3.5406-03-1.9203-03-1.7568-03-4.5369-03
SINE COEFFICIENTS
-4.7729-02-1.7351-02 7.0737-03 1.9094-02 2.9334-03 4.6804-04-5.7162-03-3.8534-03
-1.8753-03-5.0572-06 2.6993-03 7.7569-03 3.6277-03 1.0549-02 5.9268-03 4.2084-03
-2.9645-03-2.7871-03 1.2635-03-5.7055-04 5.2044-03 1.7211-03-3.8385-03-1.6438-03
-6.6820-04-7.5529-03 8.2384-05-3.7954-03 1.0034-03 2.0277-03
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TABLE II - Concluded

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SPAN 5  CHORD 1        STEADY=  9.8304E00
COSINE COEFFICIENTS
-1.6596E00-1.2404E00-6.6369-01-3.8059-01-1.1047-01-2.8423-02-5.4526-03 1.0968-02
-3.8994-03-1.5860-02 1.7104-02-1.1093-02-2.7075-02-9.0516-02-2.1754-02-2.4752-02
-4.1009-02-1.8956-02-1.3232-02 3.7125-03 1.2127-02 3.6494-02 2.6005-02 2.6624-03
 7.8025-03 2.4996-02-3.4414-02-1.7907-02-1.3129-02-1.0545-02
SINE COEFFICIENTS
-6.8719-01-8.1859-01-1.1993-01 8.5975-02 3.3376-02 3.7790-02-4.4579-02-2.0696-02
-8.2308-03-4.8822-02-6.9061-02-6.5330-02-4.4534-02-2.0549-01-9.6744-02-5.9658-02
-3.8119-02 1.2303-02 6.0929-02 8.1873-02 3.5231-02 1.2802-02 1.3826-02-1.1200-02
-2.0696-02 9.6773-03-2.6531-02 5.9396-03 9.2508-03 2.5196-02
SPAN 5  CHORD 2        STEADY=  2.5259E00
COSINE COEFFICIENTS
-3.7722-01-2.8959-01-1.1734-01-7.2880-02-6.9081-02-7.7209-03 5.1103-03 2.5126-03
 6.3896-03-1.8722-02-1.9751-02-8.3092-03-1.4490-02-8.5917-03 1.2548-03-8.7066-03
-2.2100-03-9.5015-03-9.9068-03 3.4556-03 8.6775-03 1.0221-02 6.5280-03 6.3178-03
 5.3227-03 4.2505-03-1.0978-03 2.0117-03 8.4952-04 4.4717-04
SINE COEFFICIENTS
-9.8361-02-2.0992-01-6.1597-02 2.7910-02 1.4647-02-3.3070-03 3.4487-03-3.0249-02
-3.7474-02-2.3711-02-2.9421-02 1.3507-04-6.1121-03-1.4266-02-6.5356-04-8.0299-03
-1.2949-03-1.2461-03 1.4980-02 1.3076-02 ".9412-03 3.9418-03-1.7798-03-3.6476-03
-7.1338-03-8.1590-04 2.2453-04 5.6537-03 8.0248-03 1.5282-02
SPAN 5  CHORD 3        STEADY=  1.2639E00
COSINE COEFFICIENTS
-2.4124-01-2.1881-01-8.3634-02-4.0030-02-4.7826-02 1.4367-02 1.0826-02 1.0908-02
 9.3417-03-1.8416-02-1.7671-02 2.6224-04-6.0860-03-2.1235-03 9.0087-03-1.1013-02
-4.5433-03-.1041-02-1.3626-03 4.8760-03 6.2006-03 9.0849-03 7.2772-03-1.6576-03
 2.7372-03-1.8826-03-1.4716-03 4.7916-03 4.6726-03 3.6969-03
SINE COEFFICIENTS
-1.5178-01-1.7806-01-4.8001-02 2.7917-02 1.3979-02-6.2191-03 2.4727-03-2.9592-02
-3.4499-02-1.4772-02-1.9321-02 1.0746-02 4.7960-03-1.0340-02-5.3674-03-1.1636-02
-1.6140-03 5.1261-03 1.6911-02 1.0681-02-3.6546-04-1.2568-04-6.1935-04 5.0139-09
-4.5858-03 1.8797-03 1.6431-03 8.8396-03 5.0994-03 5.4623-03
SPAN 5  CHORD 4        STEADY=  4.7708-01
COSINE COEFFICIENTS
-7.9225-02-7.4821-02-2.3488-02-1.1087-02-2.3349-02 5.1036-03 6.3273-03 8.4353-03
 5.9461-03-6.6398-03-5.9131-03 1.6228-03-2.0853-03 8.8724-04 3.1532-03-3.8317-03
-7.7469-04-4.4396-03 1.7617-03 4.1118-03 4.1378-03 3.7725-03 2.0608-03-9.7410-04
 2.3043-03-1.4790-03 1.4708-03 3.4300-04 1.1362-03 1.3324-03
SINE COEFFICIENTS
-7.1022-02-6.8677-02-2.6652-02 7.5530-03 1.0709-03-3.9655-03 6.1016-03-8.4271-03
-1.2929-02-4.3641-03-8.7898-03 7.9681-03 2.6996-03-2.9661-03-2.0662-03-4.6562-03
-5.2572-05 2.6007-03 4.9700-03 3.5243-03 1.2128-03-1.3730-03-1.7840-03 1.6872-03
-1.3981-05-7.9569-04 3.2221-04 3.0294-03-3.5878-04 7.7917-05
SPAN 5  CHORD 5        STEADY=  1.8145-01
COSINE COEFFICIENTS
-7.0866-02-6.5144-02-1.4039-02-5.5659-03-8.1222-03 9.7118-03 1.1004-02 7.8894-03
 2.4851-03 8.3311-03 8.5385-03 1.2029-03 1.5242-02-2.5991-02-8.9675-03-3.8741-03
 1.6540-03-6.4288-03-4.6925-03 3.3192-03 3.9116-03 2.5401-03 4.6753-05 1.2859-03
 3.4350-03 8.7009-04 1.4517-03-6.4478-04-1.2123-03 3.4983-03
SINE COEFFICIENTS
-7.9007-02-7.2525-02-1.2389-02 2.1958-02 3.9799-03-3.4117-03-2.4317-03-5.3973-03
-8.3407-03-6.0708-03-4.8531-03-1.6882-03-1.5945-02 3.5526-02 1.0049-02-1.6938-03
 1.6474-04 3.5160-03-6.1722-04 3.3869-03 7.0822-03 1.0413-03-2.6955-03-6.0742-04
-8.6310-04-9.0140-03 1.5820-03 4.6135-03 1.9016-03 4.6161-03
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TABLE III. AERODYNAMIC DATA - HOVER, RIN, 210° HEADING

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BURST NO. * 8              *** ROTOR NOISE PUNCHED OUTPUT ***
BLADE PITCH HARMONICS
 1.3149+01-5.1298-01 1.5972+00  *COLLECTIVE, LONGITUDINAL, LATERAL RESPECTIVELY*
ROTOR FLAPPING ANGLE HARMONICS
 1.6186+00-1.8674+00 0.0000     *POSITIVE TAIL HIGH -- DEGREES*
DIFFERENTIAL PRESSURE HARMONICS FOR 5 CHORD STATIONS AT EACH OF THE 5 SPANS
*MEASURING FROM THE LEADING EDGE AND THE BLADE ROOT RESPECTIVELY*.
SPAN 1  CHORD 1          STEADY*  1.2647+00
COSINE COEFFICIENTS
-6.3271-02 1.5366-01-2.3798-02 1.9142-02-6.4235-04 2.1418-02 2.9006-03 4.3904-03
 1.7620-03 7.6723-04 2.7176-03 7.1654-03-1.1713-02-7.1462-04-1.0302-02 5.7290-03
-1.4834-03 3.7584-03 7.5091-03-1.1189-03 1.8806-04-3.6035-03-1.3170-02 3.8185-03
-6.0449-03-4.6755-03-4.9406-03 4.3349-05-3.2237-03-6.9466-03
SINE COEFFICIENTS
-6.7975-02 1.1582-01 1.6155-02 9.6492-03 9.3598-04 2.4391-02 6.8212-03 8.3991-03
 8.8698-05 3.8080-03 8.0825-03 1.0828-02-3.6018-03 4.7461-03 3.3214-03 2.4827-03
-9.3148-03 2.3212-03 3.4229-03-3.2708-03-7.9586-04 1.3454-03-7.3544-03-9.2106-03
-3.0386-03-5.0275-03 4.7932-03 2.8240-03 5.7599-03-4.1448-03
SPAN 1  CHORD 2          STEADY*  5.1060-01
COSINE COEFFICIENTS
-2.1787-02 4.9361-02-1.3132-02 1.0606-02 6.0639-03 1.1250-02 1.5358-03-1.0683-04
 6.5109-03-1.8269-03 1.3765-04 6.9291-04-3.4552-03-2.7963-04-3.3681-03 3.0101-03
-7.5558-04 1.9744-03-1.9263-03 1.0037-04 7.0569-03 1.8911-03 3.9040-03-1.2772-03
-3.8435-04-9.5977-04 2.4985-03-8.1280-03-5.8801-03 4.0514-03
SINE COEFFICIENTS
-2.3541-02 4.0190-02 8.9051-04 6.4219-04 5.7319-03 8.5890-03 4.7969-03 5.7645-03
 1.7015-03 2.9611-03 4.0187-04 2.1719-03 1.5255-03 2.0816-03 4.6504-03 1.6018-03
-2.9568-03-1.5157-03-6.5650-03 5.8280-03 5.9581-04-2.1374-04 1.6758-03-6.8024-04
-3.6145-03-7.1126-03-1.8618-03 3.6644-03-2.4072-03 3.2561-03
SPAN 1  CHORD 3          STEADY*  2.3039-01
COSINE COEFFICIENTS
 3.9569-05 3.4833-02-7.4390-03 9.5495-03-6.8038-03 6.7903-03 4.2903-03-8.8721-04
-3.4871-03 3.0704-03 5.8936-03 1.0261-02-4.4525-03 4.2405-04-1.3115-03-4.0145-03
-2.5574-03 5.5405-03-1.6810-04 2.2049-03-1.8030-03 5.8978-04 3.8212-03-2.7464-03
-3.8807-04-4.7112-04-6.3374-03-1.7289-03-4.9188-03 1.9365-03
SINE COEFFICIENTS
-1.8026-02 3.4091-02 1.5406-02 2.2868-03 3.8950-03 2.9831-04 3.8640-03 2.1162-03
 6.7870-04 3.0249-03-1.3121-03 7.6481-04 2.9948-03 2.8343-04 1.9835-03-1.1111-03
-6.2693-04-2.0618-03-1.8063-03-2.2800-04 6.2882-04 4.0359-04 1.8732-03-6.6305-03
-1.3897-03 3.7408-03 4.0968-03 3.2987-03 3.0029-04-5.3583-04
SPAN 1  CHORD 4          STEADY*  0.0000
COSINE COEFFICIENTS
 0.0000     0.0000     0.0000     0.0000     0.0000     0.0000     0.0000     0.0000
 0.0000     0.0000     0.0000     0.0000     0.0000     0.0000     0.0000     0.0000
 0.0000     0.0000     0.0000     0.0000     0.0000     0.0000     0.0000     0.0000
 0.0000     0.0000     0.0000     0.0000     0.0000     0.0000
SINE COEFFICIENTS
 0.0000     0.0000     0.0000     0.0000     0.0000     0.0000     0.0000     0.0000
 0.0000     0.0000     0.0000     0.0000     0.0000     0.0000     0.0000     0.0000
 0.0000     0.0000     0.0000     0.0000     0.0000     0.0000     0.0000     0.0000
 0.0000     0.0000     0.0000     0.0000     0.0000     0.0000
SPAN 1  CHORD 5          STEADY* -3.0049-02
COSINE COEFFICIENTS
 5.9828-03-6.4795-03 1.2106-03 7.2676-04 1.7298-03 4.6916-05 3.7134-04-1.4315-04
-4.2133-04 5.6123-04-6.9857-04-2.1011-03 7.2182-04 8.2735-04 9.5652-04 6.9424-04
 1.7673-03-1.7699-03-8.9845-04 3.9407-04 7.1498-04 5.1366-04-5.1396-04 1.5802-03
 3.6310-04 2.2840-03-2.0721-05-1.0779-04-5.6919-04-3.5682-04
SINE COEFFICIENTS
-2.9976-03-2.7345-03-4.9350-03 1.5257-04 1.1329-03-9.9202-04 5.9322-04 2.1750-04
 7.5164-04-6.8477-04 5.8769-04-8.4726-04-1.7529-03 1.3192-04-5.4939-04 3.3300-04
 5.3858-04 1.2756-03 1.7809-03-9.1001-04 2.3246-04 7.6588-05-6.3374-04 1.7986-03
-5.2556-05-1.4435-03-2.0153-03-1.6285-03-1.0511-03 2.7341-04
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TABLE III - Continued

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SPAN 2  CHORD 1        STEADY=  3.1557+00
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-6.0432-01 6.5378-02 9.6619-02 1.2051-01-8.6912-03 6.1809-03 4.5970-02 1.0740-01
 6.5133-02 6.3286-02 4.6977-02-2.2366-02-3.0634-02-2.1811-02-1.2074-02-2.7465-02
-1.9019-02 8.3302-03 4.8263-02 6.4165-02 6.1966-02 1.9755-02-3.8532-02-4.1872-02
-1.8000-02-1.2138-02-4.8403-02-5.6375-03 4.5449-02 6.4245-02
SINE COEFFICIENTS
-3.1147-01 1.9749-01 1.3007-01 1.0749-01 1.0290-01 2.9494-02 5.2923-02 6.9593-02
 7.5040-03 8.5045-03-4.0499-02-6.4891-02-5.2857-02-2.3774-02-1.8771-02-2.7523-03
 2.2699-02 6.4261-02 5.1962-02 9.9979-03-3.6232-02-7.1359-02-5.6708-02-4.0063-03
 1.1965-02 2.3019-03 2.9952-02 5.2038-02 4.6977-02-1.0361-02
SPAN 2  CHORD 2        STEADY=  1.2420+00
COSINE COEFFICIENTS
-2.9688-01 2.2162-02 5.4326-02 6.8796-02 5.8967-03 2.5945-03 2.1725-02 4.9006-02
 2.2770-02 1.8230-02 1.9796-02 1.0125-03-1.6452-02-1.7981-02-7.0519-03-1.9017-02
-9.5399-03 1.4670-02 1.1905-02 2.7229-02 1.9316-02 6.6604-04-1.8130-02-1.6789-02
 6.8949-05-1.5715-02-1.2159-02 1.4596-02 2.7591-02 2.1538-02
SINE COEFFICIENTS
-1.1105-01 9.6526-02 5.4579-02 4.0758-02 3.4068-02 1.4822-02 2.2670-02 1.6158-02
-2.5893-03-8.6142-05-1.1205-02-2.1416-02-1.3914-02-2.6909-03-6.0317-03 6.3848-03
 9.0211-03 2.4896-02 1.0860-02-9.3201-03-2.4301-02-2.7801-02-2.2639-02-3.8832-03
 4.4773-03-2.7975-03 1.5003-02 1.6177-02 8.1507-04-1.4701-02
SPAN 2  CHORD 3        STEADY=  1.0430+00
COSINE COEFFICIENTS
-1.4331-01 3.2466-03 2.6389-02 3.9561-02-9.5510-04 8.1906-03 1.7911-02 2.4234-02
 9.3848-03 9.5470-03 1.1601-02 4.9699-04-7.0805-03-2.6373-03 1.7075-04-6.3756-03
-5.1851-03 7.9365-03 8.6847-03 1.5030-02 6.1438-03-5.1859-03-1.3181-02-1.0405-02
-5.5005-03-7.1186-04 5.1593-05 9.5756-03 1.2390-02 5.4115-03
SINE COEFFICIENTS
-6.8149-02 4.6958-02 2.0458-02 1.7331-02 1.9161-02 9.8082-03 8.9644-03 4.8526-03
-2.3109-03 5.8140-03-9.1807-03-1.6390-02-4.6924-03-6.0459-04-3.3126-03-1.5029-03
 5.1611-03 9.5756-03 2.3312-03-5.2159-03-1.1476-02-1.2930-02-5.8177-03 1.1056-03
 4.7294-03 6.6884-03 6.3732-03 5.4411-03-1.1330-03-6.9694-03
SPAN 2  CHORD 4        STEADY=  2.0854-01
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-1.8329-03-4.9836-04 3.9886-03 3.2809-03-7.4841-03-4.4422-03 1.4615-03-1.8726-03
-7.0024-04 6.1951-03 1.9999-03 6.0500-04-1.3104-03-4.1757-03-3.6371-03-4.8886-03
-7.0238-04 3.2332-03 4.0347-03 1.0154-03-1.0260-03-2.0070-03
SINE COEFFICIENTS
-8.6759-03 4.0215-02 1.6522-02 3.2601-03 1.6760-02-1.2167-03 9.7461-04-2.6032-03
-3.4172-03 6.1326-03 2.8021-03-3.5061-03 5.3758-04 4.7844-03-8.7069-04 1.2789-03
 9.0836-04-3.3735-03-2.3045-03-3.2293-03-3.3185-03-3.5701-03-1.3816-03-2.6053-03
 3.7388-03 1.7221-03 1.0407-03-3.2553-03-1.8171-04-1.2848-03
SPAN 2  CHORD 5        STEADY= -1.7373-01
COSINE COEFFICIENTS
-2.9849-02 4.9327-03 5.1380-03 6.3509-03 2.8857-03 1.0807-03-1.7863-03 1.0247-03
-2.7573-03-4.0863-03-1.4608-03 1.0106-03-1.8954-03-2.3643-03-1.9088-03-1.4083-03
-1.4083-04 5.1061-03 3.2543-03-3.2554-03-3.0671-03-3.1204-03-1.9335-04-1.3266-03
 1.3023-03 7.6369-04 3.5292-03 6.7610-04 3.5904-04-3.2659-03
SINE COEFFICIENTS
 1.3031-02 1.1137-02 4.4920-03-1.2502-03 3.0421-03-2.5363-03-1.9006-03-3.5707-03
-2.7431-03 1.4676-03 3.7955-03-2.6112-04 6.7564-04 2.3361-03 9.1367-04 1.3211-03
 4.6693-04-4.2658-03-3.0528-03-1.9801-03-7.6793-04 7.3475-04 1.5424-03-9.1915-04
 1.4732-03 1.0880-03 1.5391-05-2.0337-03-2.2257-03 6.1778-04
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-1.3641-01-1.2202-01 1.5811-01 1.4193-01-9.6021-03-3.9774-03 7.2505-02 9.4394-02
 1.4752-01 1.1030-01 8.5376-03 5.6976-02 1.0851-01 2.2780-02-1.0697-01-1.6016-01
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SINE COEFFICIENTS
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 7.6153-02 3.2147-01 2.4369-01 8.3325-03-1.4919-02 6.7174-02 7.2360-02 8.9527-02
 5.6776-02-4.1482-02-3.6621-03 5.5582-02-4.1511-02-1.6654-01-1.4265-01-4.7483-02
 4.6857-02-2.5095-02-7.1594-02-7.2688-02-6.1893-03 6.9352-02
SPAN 3  CHORD 2          STEADY=  3.6573-01
COSINE COEFFICIENTS
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 3.0684-02 2.4022-02 8.7488-03 1.7367-02 2.7889-02-1.1265-02-4.3295-02-3.2657-02
 5.8352-03 4.7004-03-1.8784-02-3.5088-02-1.8150-02-1.4837-02
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 9.3781-03 6.1883-02 3.5458-02 1.1610-02 5.8686-03 1.3120-03-1.8488-03 2.1381-02
 1.4394-02-1.7543-02-2.4562-02 3.0018-03-1.6856-02-3.2813-02-1.2521-02 3.4030-02
 4.2922-02-5.2281-03-5.8381-03 3.4666-03 1.8177-02 2.3179-02
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-2.9525-02-7.1025-03 2.5327-02 2.7953-02 5.5150-03 9.3457-03 1.1379-02 1.0916-02
 1.9807-02 7.8309-03 1.0577-03 7.4527-03 1.5331-02-1.3137-02-2.7436-02-1.3626-02
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 6.2252-03 3.5475-02 1.7789-02 2.6031-03 5.1917-03 6.0054-04-7.3531-03 2.3527-03
 6.8851-03-4.0234-03-3.8469-03 8.7292-05-1.7609-02-1.6502-02-6.5461-04 3.1935-02
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 8.8594-03 3.7607-03-6.5378-03 6.3317-04 1.0913-02 5.6450-03
SINE COEFFICIENTS
 3.5503-02 5.9841-02 2.4812-02 1.4649-03 1.5504-02 6.8211-03-2.8931-03-1.4748-02
-5.8968-03 2.9377-03-1.1389-03 6.4843-04 8.4922-03 4.7058-03-3.6292-03-3.5898-04
 2.0892-03-1.7047-03-4.8315-03-4.6179-03-6.0430-03 6.4950-04 8.7485-03 1.7217-02
 4.0626-03-6.5689-03 3.5113-04 1.1703-02 7.1326-03 2.1089-03
SPAN 3  CHORD 5          STEADY=  7.6976-02
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SINE COEFFICIENTS
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 2.0198-01 4.6721-02-1.5185-01-2.2553-02 1.4025-02-1.4441-01
SINE COEFFICIENTS
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-3.9416-02-1.1571-01 3.4024-02 1.0790-01-4.6614-02-1.2979-01-2.1229-02 1.6038-01
-5.3972-03-2.5519-01-7.4533-02 2.6438-02-1.1106-01-2.6578-02
SPAN 4  CHORD 2         STEADY=  3.3409E00
COSINE COEFFICIENTS
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SINE COEFFICIENTS
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SPAN 4  CHORD 3         STEADY=  1.7318E00
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-5.5984-02-4.7289-02-2.8464-02 8.7838-03-1.7982-02 1.8483-02 7.1904-03-1.6800-02
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 3.7665-02-1.3299-02-1.9411-02 1.7071-02-8.0007-03-9.3165-03
SINE COEFFICIENTS
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-6.3001-03 1.6727-02 7.4339-02 3.5969-02 2.5920-02 1.9217-02-1.0772-02 1.6227-02
 1.5202-03-5.2643-02-1.9754-02 1.4085-02-1.5579-02-1.4829-02 2.5828-03 1.4977-02
-2.4330-02-2.2850-02 2.3288-02 8.2909-03-5.1308-03 2.0914-02
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 9.8721-03 2.2071-02-1.1175-02-8.7916-03 1.4946-02 3.3207-03-1.7528-02 4.1396-03
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SINE COEFFICIENTS
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SPAN 4  CHORD 5         STEADY= -4.1377-01
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 1.2440-02-1.2577-02-2.6790-03-7.6369-03 2.6838-03-4.6745-03 2.9262-03 2.2626-04
 1.6403-03 2.5258-03-5.1709-04-6.4062-04 9.8404-03 6.1756-03-9.9783-03 4.2872-03
 8.0766-03 6.1280-03-2.9670-03 3.4057-03 1.0880-02 1.4237-03-9.6147-03 2.7417-03
 2.6310-03-5.4443-03-2.2578-03-4.4965-03-1.3301-02 2.4562-03
SINE COEFFICIENTS
 2.8875-02-1.4423-02-8.3499-03 1.7[illegible]8-02-1.6359-03-2.3580-03 1.1205-02 7.3783-03
 3.8976-03-4.5946-03 5.7636-03 4.[illegible]276-03 1.1449-03-7.9393-03 7.0904-03 7.7025-03
 1.1927-03 3.8851-03 6.3806-03 6.[illegible]487-03 4.0538-03-3.7408-04-8.2303-03 1.4612-03
 9.0379-04 1.0594-04-5.5641-03 2.1603-03 2.6551-03 5.7811-03
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TABLE III - Concluded

```
SPAN 5  CHORD 1        STEADY=  1.0140E01
COSINE COEFFICIENTS
 8.1270-01-3.5370-01 2.4003-01 2.5036-01-3.1892-02 2.4952-01-3.5342-01-4.4937-02
-2.7319-01-3.6220-01-2.8402-01 1.2658-01-6.0639-02 4.4470-02-6.0244-02-1.0252-01
-1.4074-02-3.9253-03-1.5175-01-3.9921-03-1.7202-02-2.0508-02-2.3080-01-1.4872-01
 2.0452-01 3.5410-02-8.7708-02 1.1638-01 3.5198-02-1.5819-01
SINE COEFFICIENTS
 6.6957-01-6.3023-01 6.2842-01-2.7872-01 1.3366-01-3.4347-01-1.7288-01-1.2556-01
-2.3129-01-3.9932-02 2.9022-01 8.9567-02 6.7052-02 2.5116-03-1.9218-01 2.6627-02
-3.0270-02-8.8990-02-3.8876-02 6.2461-02-5.7976-02-6.6608-02-8.7663-02 2.6946-01
 1.2571-01-1.2988-01 2.9635-02 5.0079-02-1.8889-01 6.0941-03
SPAN 5  CHORD 2        STEADY=  2.5385E00
COSINE COEFFICIENTS
 1.5805-01-7.3870-02 9.9888-02 6.8284-02 1.5492-02 7.0019-02-4.7606-02-2.1748-02
-7.4740-02-6.8947-02-3.9431-02 1.3875-02-3.7381-02 2.6241-02 3.9248-03-3.0443-02
-7.9848-03-4.2538-03-3.4262-02 5.1022-03-3.0950-03-1.0287-02-5.8107-02-9.4768-03
 5.1425-02-1.0871-02-2.7557-02 2.9741-02-8.9474-03-1.2226-02
SINE COEFFICIENTS
 1.2599-01-1.2648-01 1.2680-01-1.7043-02 3.6776-02-7.6547-02-5.1485-02-2.7991-02
-1.8366-02 2.5667-02 7.8913-02 1.2459-02 3.0507-02 3.7347-02-2.5686-02 2.9658-03
 4.3175-03-2.7577-02-6.9273-05 1.3829-02-9.6055-03-2.1131-02-9.3092-03 5.8727-02
-2.5129-03-4.6704-02 1.3584-02-2.1486-04-4.1262-02 2.1977-02
SPAN 5  CHORD 3        STEADY=  1.2635E00
COSINE COEFFICIENTS
 7.3466-02-7.0374-02 6.3303-02 4.6185-02 2.4770-02 6.7845-02-1.3275-03-7.8711-04
-4.8294-02-4.4529-02-2.8239-02 3.7700-03-3.8129-02 9.7305-03-8.1173-05-3.0978-02
-5.2614-03 3.8798-03-2.5313-02 1.2591-02 1.2101-02 3.2786-03-2.1399-02 1.0774-02
 3.4202-02-2.3749-02-2.6667-02 1.7965-02-1.0135-02-5.3685-03
SINE COEFFICIENTS
 1.5251-01-1.2009-01 8.7390-02 2.8835-02 3.7487-02-4.5329-02-3.4307-02-3.2549-02
-2.5132-02 6.8652-03 4.3240-02 4.0766-04 1.3471-02 2.8356-02-1.9328-02 5.9568-03
 1.5737-02-1.8055-02 1.3480-02 2.1090-02-6.1718-03-1.3105-02-4.0518-03 1.8661-02
-2.6480-02-4.2246-02 1.4142-02 3.4376-03-2.1985-02 2.2550-02
SPAN 5  CHORD 4        STEADY=  3.7704-01
COSINE COEFFICIENTS
 1.4621-02-2.4624-02 2.1900-02 1.1867-02 8.7505-03 3.0769-02 1.0575-02 3.0434-03
-1.0202-02-5.5399-03-5.0127-03-7.3016-05-1.3514-02 2.4298-03 2.4012-03-1.1622-02
-3.5791-03 4.1703-03-5.2615-03 6.9210-03 5.7129-03 2.1700-03-2.0291-03 7.1668-03
 8.9510-03-7.4209-03-9.4787-03 4.5003-03-1.6163-03-1.0888-03
SINE COEFFICIENTS
 6.8741-02-4.9530-02 2.6234-02 1.7611-02 1.4285-02-1.1065-02-1.2902-02-9.9176-03
-5.0025-03 2.5469-03 1.1709-02-3.7950-03 2.3204-03 9.3883-03-5.5018-03 2.5214-03
 4.4152-03-9.1177-03 4.6128-03 8.2800-03-2.2532-03-3.6395-03-4.3014-03-5.1822-03
-1.4782-02-1.4095-02 4.5181-03 2.9990-03-3.2509-03 7.5090-03
SPAN 5  CHORD 5        STEADY=  8.5374-02
COSINE COEFFICIENTS
 5.2951-02-[illegible]-02 7.1416-03-6.1708-03-9.4801-03 1.6480-02 9.7270-03 1.3731-02
 8.2455-03-[illegible]7-03-2.1267-02-1.2361-02-1.3046-02-1.8234-02-2.3370-04-2.1166-03
 3.0837-03 5.[illegible]7-03-1.4226-02 4.2858-03 3.2564-03-1.8473-03-2.4293-03 2.3379-03
 1.3046-02 1.2941-02-5.2921-03-9.5100-03-1.5936-03-1.2265-02
SINE COEFFICIENTS
 6.5530-02-5.5066-02 5.7374-03 4.5241-03-2.6133-03-7.7641-03-1.1234-02-1.2238-02
-2.0758-02-2.0038-02-5.4267-03-5.8830-03-1.9541-02 5.0524-02 1.6466-03 2.8462-03
 3.7767-04-6.6161-03 5.5116-03 1.6024-02 5.3359-03-9.9931-04-8.6674-03-6.4790-03
-7.7335-03-1.3028-02-9.8746-03 1.0012-02 7.0186-03 7.6939-03
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TABLE IV. AERODYNAMIC DATA - HOVER, RIN, 270° HEADING

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BURST NO. *  9           *** ROTOR NOISE PUNCHED OUTPUT ***
BLADE PITCH HARMONICS
 1.3162+01-1.7935-03 4.1504-01  *COLLECTIVE, LONGITUDINAL, LATERAL RESPECTIVELY*
ROTOR FLAPPING ANGLE HARMONICS
 1.7319+00-1.3847+00 0.0000     *POSITIVE TAIL HIGH -- DEGREES*
DIFFERENTIAL PRESSURE HARMONICS FOR 5 CHORD STATIONS AT EACH OF THE 5 SPANS
*MEASURING FROM THE LEADING EDGE AND THE BLADE ROOT RESPECTIVELY*.
SPAN 1  CHORD 1          STEADY*  1.3391+00
COSINE COEFFICIENTS
 1.6842-01 1.7908-01-3.5315-02 2.8173-02 2.3828-03 1.5747-02-3.2480-03 1.2006-02
-6.9201-04 1.3176-02 2.1840-03 1.2291-02-6.2994-03-2.2842-03 5.5529-03-6.8462-03
-8.4230-04-5.0420-03-4.5405-03 5.0863-03 6.3481-06 1.2869-04 5.9835-03 4.1914-03
 7.0450-04 9.7696-03-1.8725-03-1.3809-03 1.0794-02-3.1627-03
SINE COEFFICIENTS
-1.0774-01 1.2533-01 2.5883-02 3.0283-02 1.1103-03 3.3590-03 2.0545-03-1.6305-02
-3.2701-03-4.1357-03-3.3415-04 1.0375-02 1.1655-03 1.3834-03-2.5365-03 1.2223-03
 9.9692-04 1.3464-03 2.7204-03-5.3835-03 2.8116-03-2.1243-03 5.4538-03 4.6632-03
-4.7221-03-1.7358-02-4.1309-03-1.4680-02-1.1529-02-1.0957-02
SPAN 1  CHORD 2          STEADY*  5.2963-01
COSINE COEFFICIENTS
 6.5183-02 6.2497-02-1.0866-02 1.5569-02 3.7416-03 1.2803-02 2.8519-03 4.7005-03
 4.9640-03 3.8806-03 2.5518-03 3.1842-03-2.3467-03 5.8831-03 2.9942-03 7.0651-03
 9.7411-03 5.1261-03 1.1215-02-4.7935-03 3.1659-03-1.7238-05 3.6137-03 2.9904-03
 6.2260-04 5.5744-03 3.1856-04 4.4807-03 6.8716-03-1.3382-03
SINE COEFFICIENTS
-4.1635-02 4.5124-02 1.1334-03 5.1235-03 6.9334-03 6.3343-03 6.3573-03-4.0175-03
 6.5410-03-4.2926-03-4.9978-04 1.5605-03 3.1924-03 3.4042-03 1.2453-04-2.1022-03
-1.0270-04-2.4990-03-8.0563-03-7.2549-04-3.8805-03 3.7382-03-6.5514-03 5.9456-04
-5.7730-03 3.9550-04 1.6530-03-7.9366-04 9.7936-05 8.6308-03
SPAN 1  CHORD 3          STEADY*  2.8376-01
COSINE COEFFICIENTS
 3.3210-02 5.0086-02-9.3304-03 7.7756-03-5.4065-03 6.7043-03-1.4983-03 1.0917-04
 1.2784-03 5.8428-03-2.0919-04 6.5764-03 1.7223-03 1.5305-03 3.4672-03 2.6321-03
 6.6373-04-3.1118-03 2.6301-03 1.8344-03 2.3464-03 1.6020-03 3.9973-03 1.1912-03
-4.3740-03-5.4227-04-2.1922-03-1.2280-03-1.9227-04-3.3436-03
SINE COEFFICIENTS
-3.0616-02 2.0031-02 1.2894-02-1.8955-04-3.7763-03 2.9879-03 3.8278-04-5.2959-03
-2.4786-04-2.7343-03-6.6859-04-6.3080-03 4.6086-03-2.6047-03 1.1879-05-1.8410-03
 2.0149-04-1.5701-03 4.4580-03-3.0795-03-4.5819-03-3.5676-04 1.1841-03 1.4580-03
-1.3830-03 6.2292-04-1.5123-03-7.1171-04-2.2079-03 1.0266-03
SPAN 1  CHORD 4          STEADY*  0.0000
COSINE COEFFICIENTS
 0.0000    0.0000    0.0000    0.0000    0.0000    0.0000    0.0000    0.0000
 0.0000    0.0000    0.0000    0.0000    0.0000    0.0000    0.0000    0.0000
 0.0000    0.0000    0.0000    0.0000    0.0000    0.0000    0.0000    0.0000
 0.0000    0.0000    0.0000    0.0000    0.0000    0.0000
SINE COEFFICIENTS
 0.0000    0.0000    0.0000    0.0000    0.0000    0.0000    0.0000    0.0000
 0.0000    0.0000    0.0000    0.0000    0.0000    0.0000    0.0000    0.0000
 0.0000    0.0000    0.0000    0.0000    0.0000    0.0000    0.0000    0.0000
 0.0000    0.0000    0.0000    0.0000    0.0000    0.0000
SPAN 1  CHORD 5          STEADY* -2.7157-02
COSINE COEFFICIENTS
 1.8794-03-6.2034-03 2.4910-03-5.7309-04 1.6969-03 2.1634-04 7.1328-04 9.1138-04
 3.8050-04-6.3485-04 4.1897-05-1.2326-03-6.2899-04 1.1293-04 4.9786-04 4.7237-04
 1.9680-05 1.4987-03-5.7762-04 7.3349-05-2.2365-04 2.3623-04-2.3995-04-1.8601-08
 1.5844-03 8.2817-04 8.3523-04 1.3409-03-1.7806-04-4.3220-04
SINE COEFFICIENTS
 1.9348-03-2.3587-03-1.2961-03-2.5200-04 1.6961-03 3.9584-04-1.1352-04 1.8030-03
 8.4068-04 3.4002-04 3.9703-04 1.4278-03-1.1958-03-2.1222-04-2.2918-04 5.0728-04
 2.6442-04-4.2189-04-9.2546-04 3.4865-04-4.3003-04 1.2678-03 2.2019-04 1.0739-08
-7.9604-04-8.8730-04-6.9859-06-3.4260-04-1.0216-03-1.6639-03
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SPAN 2  CHORD 1         STEADY#  3.2561800
COSINE COEFFICIENTS
-2.6195-02 8.0566-02 3.8465-02 5.6249-02-7.8726-02-1.2002-02-1.2332-02-1.6883-02
 2.2656-03 2.3082-03 9.7369-04 6.2183-03-5.[illegible]697-03 2.6398-03 1.6342-02 3.3699-04
 4.1323-03 1.7636-03 1.8751-03-4.4843-03-7.6846-03-4.4869-03-5.7316-03-5.9995-03
-2.5590-03-6.7405-05-8.2191-03-1.4797-02-2.1517-02-1.1420-02
SINE COEFFICIENTS
-6.3450-01 1.7086-01 9.2658-02 1.0183-01 2.1776-02-3.2702-03-3.7421-03 1.7851-02
-1.1219-03 1.3734-02 7.3057-03 2.4148-03-7.1798-03-6.4609-03-5.0405-04-1.2543-04
-1.1970-02-2.2791-02-9.1097-03-9.2838-03 1.7900-03-3.7235-03-3.3249-03-5.6776-03
-1.3751-02-1.1019-02-8.6526-03-1.1350-02-1.0347-02 1.9506-03
SPAN 2  CHORD 2         STEADY#  1.2693800
COSINE COEFFICIENTS
-4.8758-02 3.4287-02 2.2895-02 2.6289-02-2.4423-02-6.8174-03-4.0348-03 2.3721-03
-2.9188-03 8.2303-03 3.4610-04 1.4508-03-1.8291-04 1.0405-03 3.9079-03-8.1748-03
-8.2847-03-5.7993-03-7.1038-03 4.0863-03 5.0607-04 4.1048-03 2.5819-03 3.0918-04
 1.9839-03 4.2255-03-4.1933-03-2.8798-03-7.9674-03-2.9209-03
SINE COEFFICIENTS
-2.7179-01 6.9954-02 4.1479-02 4.1469-02 2.2001-02-4.4597-03 2.1074-03 1.0134-02
 2.3286-03 5.1213-03 1.1271-04-4.4107-03-1.1333-03-5.6304-03-1.5437-03-5.9161-03
 3.1332-03-1.0027-02-3.5750-03-2.0628-03 1.4416-03-1.3282-03 2.7653-03 4.9278-03
-7.6357-03-5.6498-03-2.0884-03 6.9701-04 3.2825-03-1.9327-03
SPAN 2  CHORD 3         STEADY#  1.0478800
COSINE COEFFICIENTS
-2.0367-02 1.1062-02 1.9063-02 1.5497-02-1.8905-02-1.9825-03-5.8708-03-6.9556-03
 3.3738-03 4.8633-03-8.6791-04-1.0168-03 3.9069-04 2.3976-03 1.8303-03-2.8230-03
-4.3755-03-3.5636-03 1.8212-05-5.4817-04 7.1949-04-4.0145-04 2.5551-03-7.4207-06
-1.3055-03 1.0391-03-3.3311-03 8.3712-04-6.3477-04 4.6841-04
SINE COEFFICIENTS
-1.2919-01 5.1023-02 2.0659-02 2.6308-02 8.2394-03-7.6041-03-1.0229-03 3.6919-03
 1.2307-03 8.9076-04-3.4287-03-2.8222-03 7.0954-04-4.4967-03-5.5940-03-3.5981-03
-4.6273-03-2.1272-03-3.5937-03 2.8430-03 5.6018-04-1.0009-04 1.0749-03 1.3241-03
 2.0789-03-2.6046-03 1.4323-04 1.0453-03-2.0407-03-4.3347-03
SPAN 2  CHORD 4         STEADY#  2.2396-01
COSINE COEFFICIENTS
-3.4617-02 9.7481-03 3.6468-03 1.1163-02-2.9207-03-5.1566-03-4.1690-03 6.9874-04
-3.3803-03-9.1202-04-2.1850-03-1.2833-03-5.1229-04-5.4819-04-9.4343-04-2.0412-03
-3.7180-03-3.3778-03-2.5591-03 1.1165-03 4.2077-05-1.0721-03 6.7509-04-8.4610-04
-1.9912-03-3.4545-03-1.4642-04 5.8660-04 2.7592-03 3.1306-03
SINE COEFFICIENTS
-6.0153-02 2.4012-02 8.9261-03 1.4478-02 1.4226-02 7.0629-04 1.9482-03 5.1061-03
 7.2583-04-3.6246-04-1.3369-04 4.2040-04 1.6956-03 1.2487-03-1.2699-03 7.6353-04
-3.6030-04-4.9988-04 1.2949-03 8.6286-04-1.4042-03-1.0072-03-5.9902-04 2.4425-03
 1.3756-03 2.9639-03 1.7051-03 4.1654-03 2.3288-03-3.2252-03
SPAN 2  CHORD 5         STEADY# -1.6116-01
COSINE COEFFICIENTS
-2.2659-02 2.5924-03-3.5514-05 2.6237-03 8.4183-04-2.0539-03-1.3637-03 9.4403-04
-1.4671-03-1.5209-03-9.6818-04-1.2330-03-1.0208-03-1.5671-03-1.6839-03-5.1690-04
-3.0767-03-1.8811-03 6.0385-04-1.9055-04-2.1852-04-4.9888-04 8.9262-05-3.0953-04
-6.6990-04-6.4567-04 1.0379-04 1.5322-03 1.3567-03 5.0039-04
SINE COEFFICIENTS
-1.6026-02 1.6514-03-4.0837-04 2.1208-03 5.5532-03 1.0592-03 5.3534-04 2.5056-03
 1.5163-04-9.6982-04-1.3347-04 2.2237-04 1.6104-03 5.3541-04-2.6404-04-6.2724-04
 6.3986-04 1.4777-03 2.1207-03-3.3149-04-9.1427-04-1.4963-03 1.3560-04 2.0680-03
 9.6467-04 2.3070-03 2.1580-03 2.2973-03 4.8202-04-3.0195-03
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TABLE IV - Continued

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SPAN 3  CHORD 1        STEADY=  3.9626800
COSINE COEFFICIENTS
-4.2140-01-1.6558-02 1.2506-01 6.4239-02-3.4769-02 2.4057-02-6.3731-03 1.5331-02
-5.7983-03-6.3181-03 6.3240-03 3.2763-02 2.5458-02 2.8540-02 1.5897-02-1.2944-02
 7.2647-05 1.2205-02-2.9486-03-1.8692-02-2.4929-02-2.1527-02-8.7497-03 1.1472-03
 2.0388-03-3.2909-02-2.4275-02-1.8849-02 3.7591-03 1.9837-02
SINE COEFFICIENTS
-1.0416800 1.2569-01 1.7118-01 1.8483-01-4.2923-02-7.8210-02-4.1324-02-3.4874-03
-1.8301-02 1.4401-02 1.7617-02 3.8529-02-1.9226-02-2.5921-02-1.9675-02-1.4380-02
 1.2239-02-1.1805-02-5.6710-03-1.6661-02-1.0705-04 5.4242-03 4.8282-03 1.0997-02
-2.1203-03-3.2240-03-6.7643-03 1.8059-02 2.1719-02 2.9656-02
SPAN 3  CHORD 2        STEADY=  3.3146-01
COSINE COEFFICIENTS
-2.1848-01-5.0264-02 5.2682-03 1.7882-02-2.0651-02 6.8383-03-4.8721-03 3.5145-03
-2.9584-03-7.0348-03-1.0563-02 2.0016-03 1.6515-03 9.2537-03-3.5019-03-5.2661-03
-4.4317-03 5.9353-03 6.1150-03-2.0287-03 3.2696-03-7.0669-03-3.6144-03 8.8753-04
 7.1454-03 6.1320-03 1.3376-03-1.7130-03 4.0424-03 1.1619-03
SINE COEFFICIENTS
-2.9814-01 7.7145-02 3.4331-02 4.8915-02-1.8029-02-2.1838-02-1.7281-02-2.8042-03
-8.7475-03 2.0173-04-1.1275-04 1.3432-02 9.6817-03 3.5653-03-2.4981-03 4.2670-03
 1.7197-02 9.9131-03 5.5513-03-1.9114-03-5.7420-03 1.4436-03 9.5463-04 4.3343-03
-3.4854-03-1.6883-03-2.1644-03 1.2679-02-4.5356-03 2.0273-03
SPAN 3  CHORD 3        STEADY= -4.4979-01
COSINE COEFFICIENTS
-9.5793-02-7.1902-02-7.6209-03 1.2592-02-1.4049-02-2.3423-03-1.4657-02 5.6866-03
-5.3438-03-5.7385-03-1.8098-03 6.9503-03-2.1559-03-3.4010-03-8.0407-04-5.8360-03
 2.8641-03 8.7755-03 2.7494-03-1.5923-03-7.3590-03-2.5182-03-2.9563-03 1.5963-03
 6.6154-03 2.1767-03 7.4627-03 4.9333-03 4.1267-03-6.5402-03
SINE COEFFICIENTS
-6.8109-02 8.3157-02 1.5324-02 2.6898-02-6.4314-03-1.7204-02-8.7530-03-4.3594-03
-3.4567-03-5.0939-03 4.2684-03 7.8569-03 7.6368-03-6.0725-04-2.4121-03 6.5580-03
 8.5757-03 9.4218-03 9.2585-03-6.6195-03-2.4063-03 4.5978-03 2.5429-03-2.1029-03
 1.5153-03-4.5033-03-2.6445-03-3.0406-03-4.2355-03-9.1063-03
SPAN 3  CHORD 4        STEADY=  7.9353-01
COSINE COEFFICIENTS
-4.0169-02-5.4460-02-1.0922-02 4.2998-03-1.2180-02-7.5628-03-1.1814-02-2.0996-03
-2.2545-03 1.9594-04-5.5772-04-2.6191-04-1.0740-03-4.6783-04 9.4286-05-3.5778-03
-1.3062-03 3.2497-03 4.3041-03 2.0664-03 1.2499-03-9.8367-04 1.9897-04 2.0608-03
 5.6335-03 4.5079-03 3.8177-03 3.2941-03 1.3671-03-3.3256-03
SINE COEFFICIENTS
 3.4146-02 4.9330-02-3.5623-03 9.4769-03-2.1329-04-7.4740-03-2.3722-03-4.5061-03
-4.7427-03-4.4192-03 2.4550-03 3.7065-03 5.7557-03 1.7625-03-1.6956-04 5.5753-03
 4.6334-03 5.5609-03 1.3309-03-6.4593-04 2.6695-04 2.4788-03 2.9238-03 6.2991-04
 1.0335-03-1.3731-03 4.2059-04-2.0933-03-8.2350-03-6.2518-03
SPAN 3  CHORD 5        STEADY=  6.4519-02
COSINE COEFFICIENTS
-9.3133-03-2.4053-02-9.3614-03 3.7301-03-3.9428-04-4.0633-03-3.6451-03 4.5874-04
-1.4067-04 7.3348-04-1.6821-03-1.1019-03 1.5991-03-4.3772-04-2.6460-03-2.3488-03
-8.1775-04 3.7212-04 2.0448-03 2.5213-03 6.1371-04 2.6314-04-1.5569-03-1.2911-03
 2.7018-03 4.1399-03 3.7660-03 1.2470-03 8.6298-04-8.0648-04
SINE COEFFICIENTS
 2.3950-02 1.2823-02-7.9419-03-2.7610-03 2.9375-03 3.8406-05-9.3617-04-4.7201-04
-5.5036-04-1.1437-03 9.6820-04-9.3591-04 1.2898-03 2.8183-03 1.7813-03 1.8581-03
 1.1236-03 2.8907-03 9.5604-04 1.8101-03 1.6073-03 1.6682-03 2.1632-03-9.8397-04
-1.6060-03 8.4104-04 1.3321-03-3.4968-03-3.1927-03-1.8345-03
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TABLE IV - Continued

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SPAN 4  CHORD 1        STEADY#  9.0058800
COSINE COEFFICIENTS
-1.1492800 3.8078-01 1.7800-02 8.3182-02-1.6421-01-1.4946-01-3.0543-01-2.9599-01
-2.8082-01-2.7511-01-3.3663-01-2.5401-01-9.1879-02-7.5363-02-1.5932-01-2.0747-01
-1.2408-01 2.1149-02 6.2863-02 7.2757-02-4.0358-02-8.3896-02-3.9773-02-2.3268-02
 2.8077-02 2.7723-02 6.2708-02 7.9086-02-5.1973-02-1.2174-01
SINE COEFFICIENTS
 1.9394800 2.1087-01 8.2461-01 1.5438-01 1.9904-01 8.9929-02 1.3679-02 1.6838-01
 1.3341-01 1.5562-01 1.6570-01 2.9415-01 2.0550-01 1.5552-01 2.2645-02 9.6219-02
 1.7040-01 1.3576-01 4.7977-02-7.0558-02-8.7145-02-7.3946-02-8.4334-03 1.1666-02
-3.3724-02-2.8842-02-3.9658-02-7.9881-02-1.0100-01-2.9902-02
SPAN 4  CHORD 2        STEADY#  3.2994800
COSINE COEFFICIENTS
-2.9398-02 2.8984-01 1.3228-01-5.0713-02-1.4276-01-2.6222-01-2.5028-01-2.4615-01
-1.9077-01-1.9184-01-2.4217-01-1.5832-01-1.4267-01-1.2688-01-1.2595-01-1.5579-01
-7.1580-03 8.1608-02 1.1353-01 1.0836-01 3.3532-02 5.4116-02 9.0 06-02 1.3710-01
 1.5179-01 1.3342-01 1.2917-01 4.1765-02-7.0764-02-1.6589-01
SINE COEFFICIENTS
 5.6157-01-2.2641-02 9.5820-02-8.7039-02-4.1179-02-2.9812-03 3.3586-02 1.2966-01
 8.3767-02 1.0693-01 1.0190-01 1.3237-01 1.3437-01 6.7023-02 1.0220-01 1.5686-01
 1.7290-01 1.4916-01 4.2285-02-1.5745-02-3.6615-02 1.4696-02 2.6522-02-1.2121-02
-5.1901-02-1.1073-01-1.7022-01-2.3969-01-2.1132-01-1.0852-01
SPAN 4  CHORD 3        STEADY#  1.5881800
COSINE COEFFICIENTS
-2.9098-01-1.5789-02-2.6181-02 1.1179-02-2.9421-02-4.8791-02-2.3155-02-3.4674-02
-2.9105-02-3.8662-02-6.4827-02-1.8561-02-1.5970-02-5.5640-03-7.8043-03-1.5892-02
 4.5313-02 4.8138-02 5.0238-02 1.1520-02-1.0163-02-4.3501-03-8.1319-03 2.6395-02
 1.2595-02 8.3651-03-1.0334-02-5.1271-02-6.7287-02-5.6728-02
SINE COEFFICIENTS
 3.7514-01 1.3157-01 9.1250-02-4.6774-03 1.0908-03-1.6145-02-2.5779-03 1.2650-02
-1.5688-02 2.4381-02 4.0638-02 5.8026-02 6.0632-02 4.2182-02 6.8179-02 8.2146-02
 6.7969-02 3.1604-02-1.8746-02-1.5652-02-3.5766-02 1.1148-02 3.9999-03-4.5401-03
-2.0909-02-4.2979-02-5.2564-02-6.3307-02-1.2746-02 3.9517-02
SPAN 4  CHORD 4        STEADY#  3.0277-01
COSINE COEFFICIENTS
-1.4223-01-4.5810-02-1.8435-02 1.5628-02-1.0634-02-2.7205-03-4.6960-04 4.9624-04
 8.4933-03 2.6286-04-5.3519-03 6.6316-03 1.3129-03-1.1718-04-5.8467-03-7.1568-03
 1.2835-02 1.4436-02 9.2786-03-3.5886-03-3.8303-03-1.2983-02-8.3611-03-1.1999-03
-2.8306-03-1.0296-03-3.2705-03-6.9384-03-2.5639-02-2.2413-02
SINE COEFFICIENTS
 1.3345-01 7.3291-02 3.7994-02 1.2772-02 9.1338-03-4.8203-03 9.6660-03 5.3354-03
-4.6102-03 7.4767-03 1.0160-02 1.2187-02 9.6256-03 7.3097-03 1.5602-02 1.9852-02
 1.9274-02 7.2291-03-3.7912-03-2.1836-02-1.6249-02-1.9784-03-7.2531-03-2.0783-04
-1.3036-02-7.3959-03-1.6255-02-1.9748-02-1.1298-02 1.2267-02
SPAN 4  CHORD 5        STEADY# -4.2792-01
COSINE COEFFICIENTS
-4.7019-02-1.3724-02-3.1574-03 3.4981-03 5.1660-03 2.1604-03 1.0941-02 5.5365-03
 5.6379-03 3.9389-03 2.0462-03 1.1110-02-7.5641-04 4.2778-03-1.8454-03 3.6020-03
 1.3505-02 9.9705-03 3.9846-03-9.4549-04 8.9292-04-6.1911-04-1.4858-03-2.1100-04
 1.7966-03-1.3044-02-6.6043-03 6.9296-04-1.1892-02-4.5377-03
SINE COEFFICIENTS
 5.1595-02 1.6903-02 2.3673-02 1.5794-03 5.5796-03 3.5055-03 6.6480-04 1.6928-03
-7.5197-03 4.0236-03 6.8609-04-1.8864-03-1.5678-03-6.4372-04 6.6957-03 6.9564-03
 4.6385-03-1.9804-03-6.0872-03-5.6597-03 2.3696-03-4.1551-03-6.5229-03-5.4794-03
-7.8054-03-1.1027-02-1.7940-03 8.2144-04-5.2134-03 2.0461-02
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TABLE IV - Concluded

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SPAN 5  CHORD 1        STEADY#  9.9371+00
COSINE COEFFICIENTS
-6.0827-01 2.7319-01-2.3469-02-3.6815-01-4.4227-01-2.7694-01-3.9475-01-2.9318-01
-4.2998-02-8.7159-02-3.0186-01-2.8867-01-1.2665-01-1.3524-01-1.6564-01-2.6496-01
-1.6879-01-5.0285-02-1.1625-02 2.9200-02-5.1592-02-1.8349-01-1.3961-01-1.9779-02
 9.9594-02 9.6213-02 1.4791-01 1.3039-02-2.0274-01-2.2062-01
SINE COEFFICIENTS
 1.0464+00 2.1076-01 3.3096-02-5.8076-02 1.1000-01 1.4126-01 8.3728-02 2.8146-01
 2.3309-01-1.2403-02-4.8116-02 1.1772-01 1.3986-01 1.5624-01 1.7098-02 1.2892-01
 2.4948-01 1.8664-01 1.3938-01 5.5215-02-2.3028-02 3.8770-02 1.7478-01 1.9501-01
 1.2535-01 5.1018-02-3.1513-02-1.6543-01-1.5418-01 1.1013-01
SPAN 5  CHORD 2        STEADY#  2.4312+00
COSINE COEFFICIENTS
-4.8108-02 1.4446-01 1.3685-02-5.1488-02-1.0377-01-9.2343-02-1.0235-01-8.8501-02
-4.2025-02-6.4962-02-1.0340-01-8.2115-02-5.6245-02-4.3506-02-6.4640-02-8.8082-02
-3.7701-02 5.2474-03 3.0525-02 4.1988-02 1.1707-02-5.3303-03 2.2505-02 5.7071-02
 8.0383-02 7.3765-02 6.7132-02 2.2106-02-4.6381-02-5.7716-02
SINE COEFFICIENTS
 2.1606-01-2.3335-02-2.8074-02-6.3380-02-1.2380-02 1.1196-02 2.5424-02 5.7915-02
 4.4586-02 2.2026-02 3.6355-02 7.3436-02 6.6233-02 5.0544-02 3.8063-02 7.8334-02
 1.0767-01 9.8765-02 4.9175-02 3.3855-02 1.2337-02 3.7714-02 5.0828-02 4.2677-02
 1.3687-03-3.4270-02-6.3258-02-9.7659-02-7.9639-02-3.5164-02
SPAN 5  CHORD 3        STEADY#  1.1457+00
COSINE COEFFICIENTS
-2.4527-01 5.6637-02 7.4967-03-6.1796-03-4.2951-02-2.9705-02-2.5635-02-2.3783-02
-1.2049-02-3.7678-02-5.4034-02-3.3477-02-1.5469-02-3.2069-03-1.5968-02-2.6059-02
 1.1721-02 3.0024-02 3.7766-02 3.4077-02 2.9848-03-1.4622-02-1.9873-03 1.5084-02
 2.3848-02 1.9720-02 7.0547-03-3.0676-02-6.6614-02-5.8300-02
SINE COEFFICIENTS
 2.3424-01 8.0627-02 7.6542-02 6.4737-03 3.4986-02 3.5772-02 2.8117-02 3.2389-02
 1.0842-02 1.2315-02 3.2784-02 5.6530-02 4.6478-02 3.7762-02 2.9375-02 5.0552-02
 5.4222-02 3.5874-02 1.4182-02-2.0419-02-2.6300-02-7.3620-03 2.8993-03 8.3257-03
-1.2733-02-3.1236-02-4.9182-02-5.7860-02-2.2242-02 1.6864-02
SPAN 5  CHORD 4        STEADY#  3.2058-01
COSINE COEFFICIENTS
-9.7978-02 2.6093-02 4.5624-03 1.1747-02-8.4286-03-2.6038-03-1.0875-03-1.0375-02
-1.5772-03-8.1145-03-1.3218-02-7.5366-03-1.1116-03 2.2930-03-1.3621-03-3.5840-03
 5.0619-03 5.7118-03 6.5819-03 4.6171-03 6.5591-04-5.7831-03-4.5844-03-4.1745-04
 2.3818-03 6.0762-04-2.7882-03-1.0170-02-1.6714-02-1.0417-02
SINE COEFFICIENTS
 8.9161-02 3.2622-02 2.4382-02-2.9534-03 7.2718-03 3.6063-03 3.1751-03 4.2036-03
 5.1663-04 4.3205-03 9.2968-03 1.4501-02 1.2372-02 9.0445-03 6.7347-03 9.2036-03
 7.0369-03 1.7710-03-2.6076-03-7.2529-03-9.4363-03-2.5980-03-1.1655-03 5.0617-03
 8.3535-05-4.5633-03-6.8534-03-8.1088-03 2.8944-03 1.3177-02
SPAN 5  CHORD 5        STEADY#  2.9080-02
COSINE COEFFICIENTS
-7.5962-02 1.7043-02 1.5677-04-5.2604-03-1.3253-02-8.7536-03-9.4362-03-1.9447-02
-1.4931-02-2.0200-02-1.3825-02-1.2621-02-1.5843-02 4.1064-02 3.2690-03 1.2713-03
 4.1836-03 7.8333-03 4.3685-03 4.2320-04-5.2100-03-5.7101-03-2.5326-03-2.1040-03
 3.7589-04-5.9612-03-2.2397-03 6.1892-03-3.1348-03 2.0977-03
SINE COEFFICIENTS
 1.0193-01 2.7529-02 1.1419-02-1.3953-02-6.8675-03 5.9157-03 5.5643-03 6.5323-03
 9.1863-04 6.0095-04 3.3281-03 8.7541-03 5.3276-03 1.7684-02 2.7949-03-6.6509-03
 1.9094-03-3.3910-03-6.9624-03-2.5813-03-7.0699-03-8.7087-03-6.9721-03 7.6937-03
 7.4446-03 6.9831-03 1.3745-03-1.0284-02-6.9086-03 1.2807-03
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TABLE V. AERODYNAMIC DATA - 120-KNOT, EAST-TO-WEST FLIGHT

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BURST NO. # 22          *** ROTOR NOISE PUNCHED OUTPUT ***
BLADE PITCH HARMONICS
 1.2625&01 3.5712&00-5.1429&00  %COLLECTIVE, LONGITUDINAL, LATERAL RESPECTIVELY#
ROTOR FLAPPING ANGLE HARMONICS
 1.9390&00 3.2634-01 0.0000       %POSITIVE TAIL HIGH -- DEGREES#
DIFFERENTIAL PRESSURE HARMONICS FOR 5 CHORD STATIONS AT EACH OF THE 5 SPANS
%MEASURING FROM THE LEADING EDGE AND THE BLADE ROOT RESPECTIVELY#.
SPAN 1  CHORD 1         STEADY#  1.4568&00
COSINE COEFFICIENTS
-7.4482-01 5.7765-01-1.7217-01-7.9422-02-4.2300-02 8.1176-03-2.0610-02-1.4874-02
-4.8917-03-7.2146-03 6.8540-03 1.0963-04-4.5696-03 9.2308-03-3.1371-05 1.6227-03
-6.7244-03 1.4672-03-1.3230-02 3.1987-03 3.1619-03-2.3549-03-7.2003-03-5.1666-03
-7.6619-03-1.6835-02-1.5855-03-6.1061-03-1.1113-02 1.9844-03
SINE COEFFICIENTS
 4.6525-01 7.8078-02 2.3710-01 5.5845-02-7.1875-02 2.8246-02-2.3821-02 5.7133-03
-1.2296-02-5.7320-04-1.1370-02-5.2076-03 2.3773-03-9.3344-03 1.5070-03-3.9605-03
 3.1831-03 9.8516-03 7.0955-03 2.2616-03 6.9634-03 5.2881-03-7.0636-03 8.8973-03
-1.1884-02-7.6464-03-8.6827-03-4.9929-03-1.9067-02-5.3780-03
SPAN 1  CHORD 2         STEADY#  5.4156-01
COSINE COEFFICIENTS
-2.4636-01 2.0155-01-4.9338-02-1.5852-02-1.9650-02 5.6638-03-2.7492-02-9.2798-03
 1.0997-03-2.5682-02-1.0031-02 2.1103-03-3.3353-03-1.7690-02 1.0430-02 3.0415-02
-2.3046-03-1.0057-02 7.7924-03 3.4162-04-1.8156-02 2.6505-02-9.1599-03 2.0058-02
-1.1976-02 1.5860-02 1.8897-03 9.1921-04 6.2731-03 1.2220-02
SINE COEFFICIENTS
 2.5516-01-9.9657-03 9.1324-02 1.8870-02-5.8307-03 3.3587-02 4.6306-03-2.4508-03
 1.3630-02 1.1632-02-8.2042-03 4.1081-05-3.3960-03 5.2048-03 1.0476-02-1.4143-03
-4.8729-02-1.1569-02 4.2906-04-2.5889-02-8.9785-03-2.3390-02 2.6361-03-2.6353-03
-8.6197-03-2.1535-03-7.3608-03-5.9645-03-1.3473-03-5.7290-03
SPAN 1  CHORD 3         STEADY#  2.0702-01
COSINE COEFFICIENTS
-1.4976-01 1.5017-01-4.7000-02-1.9800-02-1.8586-02 1.0418-02-9.1389-03-2.0345-03
-2.1773-03 1.6361-03-2.8154-03-2.2022-03-2.5311-03-9.7455-04 3.1904-04 1.4679-04
-1.6788-03 5.8812-04-3.1973-03 2.4294-03-1.6418-04-3.3378-03-1.8380-03-2.8117-03
-2.4129-04-2.5920-03 1.0302-03-5.4132-04 1.3102-04-2.1952-03
SINE COEFFICIENTS
 1.1891-01-9.8714-03 3.9401-02 1.5518-02-1.4820-02 1.2132-02-6.9932-04 3.4399-03
-3.6431-04 1.5494-03-2.4100-03-2.3941-03-5.5364-03 1.6429-03-1.3129-03 3.2366-03
-1.4123-03-7.4724-04 2.1920-03-4.5327-03-1.7192-03-2.0403-03 1.7560-03-3.2223-03
 3.1668-04-3.4183-04-2.6214-03-3.0882-03-4.5381-03-5.2426-03
SPAN 1  CHORD 4         STEADY#  0.0000
COSINE COEFFICIENTS
 0.0000    0.0000    0.0000    0.0000    0.0000    0.0000    0.0000    0.0000
 0.0000    0.0000    0.0000    0.0000    0.0000    0.0000    0.0000    0.0000
 0.0000    0.0000    0.0000    0.0000    0.0000    0.0000    0.0000    0.0000
 0.0000    0.0000    0.0000    0.0000    0.0000    0.0000
SINE COEFFICIENTS
 0.0000    0.0000    0.0000    0.0000    0.0000    0.0000    0.0000    0.0000
 0.0000    0.0000    0.0000    0.0000    0.0000    0.0000    0.0000    0.0000
 0.0000    0.0000    0.0000    0.0000    0.0000    0.0000    0.0000    0.0000
 0.0000    0.0000    0.0000    0.0000    0.0000    0.0000
SPAN 1  CHORD 5         STEADY#  1.8378-01
COSINE COEFFICIENTS
 4.2233-03-2.7972-02-8.3308-04 5.1288-04 1.5295-03-1.5990-04 9.2070-04-4.0257-04
 9.4991-05-2.3272-04 3.4959-05 7.1013-04 5.8079-04 1.8464-04-4.2370-04-3.5136-05
 8.7300-05 8.1967-04 6.9089-04-4.4642-04-4.5523-04 5.1218-04 2.2215-04 3.1602-04
-4.5999-04-1.4355-04-2 4600-04 4.1947-04 5.4477-05 1.2274-04
SINE COEFFICIENTS
 4.3927-02 4.8164-03 4.8729-03-1.9127-03 2.3182-03-5.3892-04 1.6917-03-4.7524-04
-4.8457-04-1.7800-03-1.7275-04 5.8059-04 6.9052-04 4.4626-04 5.5114-04-2.6664-04
 1.8028-04-6.0664-04-7.1408-04 7.9988-04 1.1400-04-1.4340-04 1.8722-04 1.3294-03
-3.8967-05 1.6861-04-3.0716-04 1.3327-04 2.5797-04 9.8862-05
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TABLE V - Continued

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SPAN 2  CHORD 1          STEADY#  4.2722800
COSINE COEFFICIENTS
-2.3649-01 1.5318800 1.5158-02 2.3440-01-2.5583-01 2.8601-01-2.2117-01 8.1035-02
-6.0594-02 6.9470-02-8.6874-02 2.4340-02 9.6925-03-3.8683-02-5.5372-03-2.0649-02
 2.9734-02-6.4705-02 3.1226-02-1.7829-02 9.8389-03-1.8134-02 2.8859-02-1.3211-02
-2.2058-03 1.1020-02-3.6638-03-6.5718-03-1.3667-02 6.0206-03
SINE COEFFICIENTS
 5.2138-02 4.4109-01-4.4853-02-1.6782-01-2.0936-01-3.1471-02-9.7771-02-4.2937-02
 7.1904-02-1.4118-01 4.1161-02-4.9886-02 3.1363-02-7.4788-02 4.5057-02-4.2731-02
-1.9634-02-1.8077-02 9.8917-03-2.1562-02-2.2859-02 2.8224-02-3.2639-02-1.6496-03
-1.3169-02 1.1753-02-2.8154-02 7.5791-03-1.0934-02 6.9984-04
SPAN 2  CHORD 2          STEADY#  1.7564800
COSINE COEFFICIENTS
 2.4430-02 6.3029-01 3.5406-02 5.5528-02-9.9657-02 9.8290-02-6.6809-02-5.4583-03
 4.8262-03 6.5483-03-1.8989-02 6.1269-04 1.2150-02-1.4224-02-2.9350-03-1.8880-03
 1.1128-03-1.0442-02 1.3955-02-1.3369-02-3.3570-03-4.7733-03 5.8630-04-5.0625-03
-9.2579-03 1.7942-03-7.0164-03-7.5876-03-6.8897-03 5.4202-03
SINE COEFFICIENTS
-1.6657-01 1.6537-01 2.2208-02-9.3301-02-7.6919-02-1.7151-02-2.7948-02-1.8272-02
 2.3453-02-3.6943-02 2.2799-03 4.2177-03-5.4021-04-1.5144-02 4.8246-03-3.6005-03
-1.8131-02 6.2545-03-2.0468-03-1.0135-03-3.6062-03 4.9982-03-6.3333-03-1.1087-03
-1.9168-03 2.7236-04-1.0288-03 2.6163-03 1.7299-03-1.5207-02
SPAN 2  CHORD 3          STEADY#  1.4598800
COSINE COEFFICIENTS
 2.2511-02 3.6158-01 2.9670-02-8.1435-03-5.2049-02 6.4869-02-2.2885-02-3.0881-02
 6.0847-03 2.3359-02-6.0422-03-2.8202-02 4.8255-03 1.3468-02-3.5428-03-1.8616-02
-3.3992-03 2.0576-02 2.0275-03-2.3411-02-3.7878-03 2.5415-02 1.0877-03-2.6266-02
-3.1227-03 3.2343-02-4.4579-04-3.6554-02 3.3873-03 3.5356-02
SINE COEFFICIENTS
 3.0172-02 6.1531-02 5.4186-02-5.7561-02-6.7475-02-9.0848-03 6.9631-03-3.5980-03
-1.8405-02-1.8802-02 1.9977-02 5.7739-03-3.0787-02-1.4436-03 2.4975-02 9.7850-04
-3.5249-02 1.6301-03 2.5442-02-7.9773-03-2.8837-02 2.1569-03 2.2229-02-4.3321-03
-2.8145-02 2.6202-03 2.7854-02-3.4656-03-3.0225-02-4.7867-03
SPAN 2  CHORD 4          STEADY#  2.8750-01
COSINE COEFFICIENTS
-1.5777-01 2.2544-01 4.6429-02 7.0774-03-2.3378-02 1.7624-02 2.0778-03-5.8818-03
 3.0637-03-1.1361-03-1.1694-03-1.9702-03 2.4146-03-2.8752-03-3.6467-03 1.7119-03
 8.1808-04-9.0785-04-4.4631-04 3.1964-03-2.3056-03-8.9511-04-1.0922-03 2.0212-03
-2.4735-03-1.7343-03 7.9123-04 1.3782-03-3.5898-03-1.6883-03
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-1.9855-01-9.4690-03-1.0131-02-3.7702-02-7.7190-03-8.7350-03-1.0490-02 1.5194-03
-3.1548-03-7.9898-03-5.2153-03 5.8143-03-5.5728-03-4.5219-04 6.7259-04 6.7203-04
-6.8408-03-3.5542-05-1.7459-04 1.0072-03-2.4067-03-1.4061-04 1.5742-03-2.6867-03
-2.3164-03 4.9780-04 1.2144-03-4.1108-03 4.5598-04 8.5182-04
SPAN 2  CHORD 5          STEADY# -2.1236-01
COSINE COEFFICIENTS
-1.8048-02 5.7544-02 1.4526-02-2.9197-03-1.8478-03 2.1982-03 4.3128-03-3.1864-03
 2.7489-03-2.4889-03 2.1316-03-1.5358-03 1.7566-04 1.3953-03-1.9439-03 2.3691-03
-3.2888-03 2.0995-03-2.8652-03 3.7502-03-4.6492-04 3.0487-05-1.7971-03 1.3268-04
-6.3037-04-1.6462-03-6.3803-04 4.0261-04 1.1596-03-2.2121-03
SINE COEFFICIENTS
-2.0536-01-1.3468-03-6.9293-03-8.4404-03 3.2130-03-4.2153-03-3.7461-03 2.4358-03
-2.5767-03-9.4456-04-2.7604-03 5.1314-03-6.5623-03 8.7684-04-1.2620-03 2.6795-03
-2.6315-03-7.2211-04 9.4115-04 1.0325-03-1.0996-03-8.6236-04 2.9955-03-1.3021-03
-8.4877-04-8.0294-04 2.7616-03-1.8390-03-1.2594-03 7.0885-04
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TABLE V - Continued

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-1.3109-01 7.4559-02 7.2098-02-6.4662-02 7.1090-02-4.1483-02-4.4403-02 8.2176-02
-5.7059-02-1.6204-02 6.2011-02-4.4524-02 2.7830-02 2.1205-02-4.7924-02 3.7390-02
-2.8163-02-3.7839-02 3.7416-02-3.5942-02-2.3428-02 1.9978-02
SINE COEFFICIENTS
-3.0113-01 2.6807-01 4.4775-01-5.8180-01-2.9404-01 1.2776-01-1.5443-01 1.6001-02
-1.5213-02-5.8790-02 1.2276-01-8.9101-02-5.2156-02 1.0013-01-6.4027-02-4.3964-02
 2.6436-02-6.9526-02 2.8424-02-1.6258-02-5.9177-02 3.6733-02-3.9539-03-3.0193-02
 4.0370-02-3.0515-02 2.5586-03 1.2249-02-6.0649-02 9.3748-03
SPAN 3  CHORD 2         STEADY#  4.1445-01
COSINE COEFFICIENTS
 5.4260-01 6.6204-01 9.3063-02-5.3235-03 1.4614-02-2.1057-02 2.2224-02 2.7817-02
-4.3444-02 5.3779-03 3.2122-02-1.7330-02 1.1218-02-7.9375-03-1.3440-02 2.8506-02
-1.7349-02-1.1185-02 1.9985-02-1.5819-02 3.3136-03-5.9482-03 2.9050-04 1.8759-02
-2.5194-02 1.9804-03 1.6197-02-5.5710-04-1.1419-02-5.4071-03
SINE COEFFICIENTS
-1.0178E00 2.3249-02 2.0564-01-2.3303-01-1.2795-01 6.5960-02-3.1235-02-1.7776-02
 2.2658-04-1.9850-02 2.1739-02-2.4181-02-1.6462-02 3.2430-02-1.7944-02-1.1781-02
 1.1839-02-2.2416-02 6.6177-04 3.0618-03-2.8102-03 4.5852-03-2.1083-02 8.0087-03
 8.0558-03-2.1393-02 2.5145-03 1.0046-02 5.7084-04-1.3029-02
SPAN 3  CHORD 3         STEADY#  1.3695E00
COSINE COEFFICIENTS
 6.8649-02 4.0684-01 8.6174-02-8.9687-03-3.5912-02 2.7245-02 1.6812-02-1.9448-02
-1.7870-02 2.3730-02 1.5250-02-2.7392-02-2.3170-03 2.7432-02 6.7491-04-2.4072-02
-5.4663-04 2.3328-02 7.4809-03-2.6180-02-6.8593-03 2.8800-02-1.2320-03-3.2040-02
 2.9541-03 2.9387-02-4.9411-03-3.0444-02-3.0846-03 3.0826-02
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-3.5260-02-2.7143-03 2.7159-02-1.0729-02-3.5108-02 6.0908-03 2.6802-02-1.0308-02
-2.7446-02 1.9612-04 2.4146-02-3.2497-03-2.9976-02-5.1463-03 2.5999-02 1.4024-03
-2.7361-02 4.3472-03 2.6702-02-4.5198-03-3.2309-02-5.9820-03
SPAN 3  CHORD 4         STEADY# -4.8522-01
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-3.1555-02 1.6562-01 4.2202-02 1.5081-02-2.8691-02 6.7586-03 1.2966-02 1.2489-03
-4.1574-03-4.3356-04 3.8774-03 1.7146-03-2.6127-03 8.1047-04 2.1286-03-3.7438-03
-1.2850-03 1.3807-03 4.0549-04 1.1272-03-1.4030-03-9.4900-04 2.2790-03 7.2734-04
-4.7602-05 6.3411-04-2.3064-03-1.5214-03 7.7795-05-1.3597-03
SINE COEFFICIENTS
-2.6761-01-4.0909-02 2.2303-02-4.5977-02-2.2532-02 5.6359-04 5.3325-04-7.7331-03
-6.6103-03 2.7408-03-1.2037-03-3.0685-03-1.1404-03-1.7081-03 2.1310-03-1.9878-03
-5.3704-03 6.6354-04-1.7894-03-1.3694-03-5.9406-04-1.4078-03-4.3264-04 7.2587-10
-1.1409-03-5.5914-04 1.1059-03-1.4666-03-1.3175-03-9.7568-04
SPAN 3  CHORD 5         STEADY# -2.2523-01
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-5.6236-03 3.7976-02 1.1218-02 4.4105-03-8.9230-03 2.5730-03 4.1095-03-2.3992-03
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 4.6742-04-9.7663-04-8.4114-04 3.5605-03 2.2934-04-1.6814-03 3.2858-03-8.2625-04
-8.3204-05 1.1199-03-1.3638-03-3.3676-04 1.7880-03-2.1325-03
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-1.4354-01-9.5747-03-6.3747-03-9.5525-03 2.4382-03-4.3180-04-1.3643-03-4.0234-03
-1.3973-03 1.9441-03-3.5099-03-2.2320-04 1.1648-03-1.5222-03 1.7194-03-1.3587-04
-2.6398-03 1.0870-03-9.9843-04-1.2343-03 1.1842-03-1.8439-03 3.7856-04 2.6835-03
-2.9669-03-3.8299-04 1.0752-03-1.3046-03 3.5129-04-5.1669-04
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TABLE V - Continued

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SPAN 4  CHORD 1        STEADY#  4.2219+00
COSINE COEFFICIENTS
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 4.1671-02 2.4115-02-2.2737-02 3.6890-03 1.4919-02-1.5116-02-2.5145-02 1.2484-02
 1.4992-02-1.7823-02-1.2061-02 1.5942-03-3.3570-03-2.9734-02
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-1.4596-01-6.0190-02 6.5443-02 1.1394-02-3.8037-02 1.7802-02 8.6268-03-4.6018-02
-1.9743-02 2.7926-02-2.8598-02-4.4890-02-7.9898-03 3.4738-02-6.6040-03-3.0579-02
 2.1329-02 2.5153-03-2.4160-02-4.7104-03 9.1453-03-3.8008-03
SPAN 4  CHORD 2        STEADY#  1.3534+00
COSINE COEFFICIENTS
 8.7141-01 5.9179-01 2.1280-01-7.6427-02-2.4871-01 1.0245-01 1.2633-01-9.7509-02
 9.4810-03 7.1545-02-4.8101-02-3.3708-02 3.9035-02 1.7584-02-2.1185-02-2.0148-02
 3.3545-02 4.3082-03-2.7864-02 2.0512-02 3.7025-03-1.8362-02-9.9363-04 7.8105-03
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-8.0772-01-1.7945-01 2.3104-01 5.0903-02-3.3207-01-2.2649-01 1.3692-01 8.7372-02
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-1.0498-02 3.3286-02-3.2465-02-3.5785-02 1.5881-02 7.4866-03-5.0605-03-8.2417-03
 1.6579-02-5.6543-03-1.1504-02 5.7042-03 4.8261-03-1.4736-04
SPAN 4  CHORD 3        STEADY#  7.8889-01
COSINE COEFFICIENTS
 3.6248-01 3.1924-01 1.5049-01 1.0468-01-1.6017-01-8.1154-02 1.1455-01 3.0603-02
-5.9182-02 2.8653-02 3.5645-02-5.7182-02-4.5233-03 5.6208-02 6.7634-03-4.3613-02
-2.6304-02 2.7047-02 1.8801-02-2.0775-02-2.8112-02 3.1986-02 3.1424-02-2.9086-02
-2.4594-02 2.6488-02 1.9916-02-3.3295-02-1.2059-02 2.9702-02
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-5.8614-01-1.9595-01-2.0951-02 3.6030-02-8.2791-03-1.4133-01-6.7488-02 1.0612-01
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 5.5557-03-1.8175-02-1.2953-02 1.5164-02 5.8733-03-3.2380-02-1.2285-02 2.2755-02
 1.1507-02-2.4589-02-1.3842-02 1.6206-02 8.2495-03-9.5520-03
SPAN 4  CHORD 4        STEADY# -9.4500-02
COSINE COEFFICIENTS
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 2.8579-03-3.6149-03-1.3725-03 2.1989-03-5.6105-05 2.5207-03 3.0945-03-2.7816-03
-4.4216-03-4.4980-03 2.9586-03 4.0436-03-2.2778-03-5.9428-04 1.2087-03 8.9990-04
-1.3650-03-2.0076-03-1.0659-03-4.0665-03 3.4466-03 9.4837-04
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-4.3940-01-6.0715-02 3.2676-02-1.9340-02-3.4017-02-6.2035-03 3.5839-03 8.9499-03
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 2.3759-03-7.7407-05-2.3469-03 7.0212-04 2.0335-03-9.4908-04-1.3443-03 1.0391-04
 1.5854-03 5.0593-04-1.8310-03-2.2283-03-3.2088-03 2.0972-04
SPAN 4  CHORD 5        STEADY# -5.2422-01
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-1.2006-03-3.1719-03 5.7323-03 4.4992-04-2.2730-03 1.2670-03-5.9358-04 5.6622-03
 7.3842-03 1.1565-03-2.0662-03 1.4282-04 3.0123-03 6.7332-03
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TABLE V - Concluded

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SPAN 5  CHORD 1          STEADY#  4.0794&00
COSINE COEFFICIENTS
 1.6320&00 1.0345&00 5.5733-01 5.2797-01-8.1597-02-9.4733-02 9.6334-02-1.1048-03
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-1.0439-01-4.0029-02 4.2593-02 1.7934-02-4.1813-03-3.0920-03 2.7664-02-3.3953-07
-3.8697-02-2.5103-02-1.2134-02-3.9232-02-4.1636-02-1.1391-02
SINE COEFFICIENTS
-8.7231-01-5.5587-01-2.7464-01-1.8629-01-3.8493-01-3.7006-01-1.5998-01 2.6569-02
-1.2955-01-2.5171-01-8.7524-02 4.5626-02 4.1242-02-1.8058-01-6.5988-02 2.7126-02
 2.7822-02-9.1604-02-1.1683-02 4.1723-02-3.7507-02-4.2305-02-1.3078-02-1.3176-02
-2.4700-02-4.9869-02-5.7453-02-6.2289-03-3.6548-02-1.6428-02
SPAN 5  CHORD 2          STEADY#  1.0785&00
COSINE COEFFICIENTS
 2.4566-02 2.0730-01 1.4726-01 2.1827-02-9.6305-02 2.5040-02 2.5082-02-2.9232-02
 1.9610-02 3.7238-02-3.3776-02-5.0026-02 1.7069-02 5.4532-02 6.0839-03-5.7406-02
-1.2057-02 4.0516-02-2.7389-03-3.9892-02 1.0315-02 5.3264-02-1.1537-02-6.0441-02
 5.6521-03 6.4047-02-4.6132-03-6.5913-02 9.4463-03 6.1140-02
SINE COEFFICIENTS
-1.5764-01-2.4628-01-6.6378-02 3.4277-02-4.7703-02-8.3079-02-7.0114-02 2.8966-02
 7.3878-02-5.7924-04-8.0982-02-2.4167-02 6.5775-02 8.4083-03-5.8874-02-9.1064-04
 5.2164-02 2.4647-03-6.8990-02-1.3862-02 5.7362-02 1.0580-02-5.4039-02-1.0578-02
 5.6184-02 1.3510-03-6.3779-02-2.8340-03 7.2195-02 9.0538-03
SPAN 5  CHORD 3          STEADY#  1.6410-01
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-1.2082-03 1.0108-02-3.1347-03-5.7847-03 4.4663-03-2.2928-03 2.7550-03-2.1232-04
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-9.1358-04 7.1126-03-4.4139-04-6.9210-03 3.8912-03-4.8343-04
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-4.0298-03-1.5871-02-7.8382-03-3.2948-03 9.3037-03 6.4567-03-8.9829-03-3.3997-03
 9.5132-04 3.0977-03 2.0947-03-5.0343-04-6.8336-03-7.4559-03 6.9313-03 2.0097-03
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SPAN 5  CHORD 4          STEADY# -2.9532-01
COSINE COEFFICIENTS
-3.3002-01 1.6966-02-3.9320-03 9.5084-03-9.9660-03 2.8621-03-5.8104-03-4.3206-03
 6.2674-03 7.9514-04-1.4501-03-3.4289-03 2.5162-03 2.3951-03-2.1823-04-9.2692-04
-4.0730-04 2.1082-03-5.8085-04-1.4226-03 1.7174-03-1.8213-03-4.1439-05-7.6532-04
 1.0753-03 2.2513-03 1.7290-04-1.4588-04 1.3390-03 6.3954-04
SINE COEFFICIENTS
-2.1927-01-4.3440-02 3.0464-02 6.8247-04-1.7954-02-1.0338-03-1.0402-03 5.4159-03
 5.1780-03 5.2981-04-4.3179-03-1.3176-03 1.2694-03 5.1522-03-1.8182-04-2.9745-03
-2.1049-03 1.8236-03 4.0824-03-1.3017-03-8.6702-04-1.2061-03-1.4779-03-1.2055-04
-3.7944-04 2.3827-04-1.3405-03 3.7605-04-1.2408-03 2.1761-03
SPAN 5  CHORD 5          STEADY# -5.4996-01
COSINE COEFFICIENTS
-1.2693-01-2.0660-02-8.0705-03 1.0484-02 6.3474-04 7.1189-03-5.5877-03-1.5001-03
 9.4024-03 1.4100-02 5.9984-03 7.4685-03 1.7111-02-4.4516-02-6.9642-03-1.0299-03
-6.1952-04 5.4070-04-1.8118-03-1.7896-03-5.1636-04 4.9739-04-1.7209-03-2.3372-04
-4.3905-04 4.0345-04-2.1098-03-4.8911-04 6.5655-05-1.6309-03
SINE COEFFICIENTS
-2.2250-01-1.5898-02 2.1463-02 1.7537-02-1.4998-02 1.2921-03-4.9869-03 4.2669-03
 5.2296-03 3.3989-03-5.4843-03-8.2889-03 1.3989-03 6.7094-03-1.7538-03-5.0530-04
-3.1772-03 2.9021-03 1.2229-04 3.4489-03-1.6710-03 2.1806-04 4.9931-05-8.0991-04
 1.2359-03 3.1782-03-4.8867-04-3.0986-03 2.3357-03 2.6529-03
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TABLE VI. AERODYNAMIC DATA - 120-KNOT, WEST-TO-EAST FLIGHT

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BURST NO. # 13             *** ROTOR HOISC PUNCHED OUTPUT ***
BLADE PITCH HARMONICS
 1.1655801 3.8118800-4.4990800  %COLLECTIVE, LONGITUDINAL, LATERAL RESPECTIVELY%
ROTOR FLAPPING ANGLE HARMONICS
 1.8620800 2.3988-01 0.0000     %POSITIVE TAIL HIGH -- DEGREES%
DIFFERENTIAL PRESSURE HARMONICS FOR 5 CHORD STATIONS AT EACH OF THE 5 SPANS
%MEASURING FROM THE LEADING EDGE AND THE BLADE ROOT RESPECTIVELY%.
SPAN 1  CHORD 1          STEADY#  1.7694800
COSINE COEFFICIENTS
-7.5170-01 5.4576-01-1.9337-01-1.8140-02-1.2594-02-3.4101-03-1.0181-02 1.1191-02
-2.0304-02 8.7802-03-2.0313-02 1.9376-02-2.1629-02-3.8817-02-1.3646-02-2.5201-02
-2.4527-02-1.4736-02-2.5566-02-1.6921-03 6.3757-04-2.7940-02 3.1563-03-9.6939-03
-1.4280-02 1.2005-02-1.6829-02 4.7947-03-4.3391-04-1.8142-02
SINE COEFFICIENTS
 5.1720-01 2.6738-01 1.5931-01-8.5007-03-8.5373-02 4.3396-02 1.9723-02 9.0404-04
-2.0486-02 3.2938-02 3.8468-02 2.3150-02 2.6626-02 1.8542-02 1.8515-02 1.8530-02
-2.2601-02 3.7740-03-1.4594-03-1.0460-02-9.8242-04-1.6166-02-4.4921-03 7.6054-03
-1.6880-02-6.1982-03 9.7283-04-2.1845-02 7.9175-03-2.4267-02
SPAN 1  CHORD 2          STEADY#  6.3098-01
COSINE COEFFICIENTS
-2.4020-01 1.9289-01-4.1643-02-9.3803-04-2.4187-02-3.6638-04 3.2773-03 8.0028-04
 7.7740-04 1.0917-02 7.0730-04 1.1040-02-1.4191-02-1.0970-02-1.5848-02-1.1412-02
-1.4545-02-7.7488-03 1.5106-02 2.6517-02 1.4778-02-2.6947-02 2.0740-02-9.6608-03
-2.1464-02 2.2522-02-2.5430-02 2.2682-03 2.0372-03 3.8938-03
SINE COEFFICIENTS
 2.8750-01 5.5752-02 7.1402-02 1.7626-02-2.4192-02 6.0528-03 3.5409-03 8.9071-03
-1.4742-02 1.8746-02 1.0996-02 2.4904-02 7.9666-03 2.3586-03 5.6477-03-3.0392-03
-9.1570-03-5.3121-03 5.7601-03-5.1451-02-4.0322-02 8.5404-04-9.2531-03-9.3195-04
-1.0168-02 1.4442-02-1.5445-02 9.1168-03-1.4088-02 1.1957-03
SPAN 1  CHORD 3          STEADY#  3.3565-01
COSINE COEFFICIENTS
-1.5953-01 1.6216-01-4.1400-02-2.2474-02-7.1217-03 1.2323-02-5.7052-03-1.2307-02
-6.7263-03 1.1647-02-4.9938-04-7.0179-03-1.4748-03 7.2055-03-4.0812-03-1.6262-02
-7.0208-03 2.3711-03-7.9461-03-1.1492-02 1.7656-03 1.1476-02 1.4181-04-1.2794-02
-4.4629-04 1.4294-02-3.0616-03-8.0629-03 4.7150-03 1.7202-02
SINE COEFFICIENTS
 1.4188-01 2.9355-02 3.9311-02 6.8192-03-3.9528-02 1.6980-02 7.0551-03 1.1667-02
-1.7890-02 1.1603-02 1.1039-02 3.9630-03-7.4319-03 2.7769-03 1.3150-02 1.3780-03
-1.3611-02-1.5647-03 8.5243-03-3.9351-03-1.6698-02-3.5108-03 8.1001-03-4.7569-03
-1.2959-02-1.0185-03 7.5402-03-3.9786-03-1.1777-02-2.6102-04
SPAN 1  CHORD 4          STEADY#  0.0000
COSINE COEFFICIENTS
 0.0000    0.0000    0.0000    0.0000    0.0000    0.0000    0.0000    0.0000
 0.0000    0.0000    0.0000    0.0000    0.0000    0.0000    0.0000    0.0000
 0.0000    0.0000    0.0000    0.0000    0.0000    0.0000    0.0000    0.0000
 0.0000    0.0000    0.0000    0.0000    0.0000    0.0000
SINE COEFFICIENTS
 0.0000    0.0000    0.0000    0.0000    0.0000    0.0000    0.0000    0.0000
 0.0000    0.0000    0.0000    0.0000    0.0000    0.0000    0.0000    0.0000
 0.0000    0.0000    0.0000    0.0000    0.0000    0.0000    0.0000    0.0000
 0.0000    0.0000    0.0000    0.0000    0.0000    0.0000
SPAN 1  CHORD 5          STEADY#  8.5796-02
COSINE COEFFICIENTS
 6.3679-03-3.0014-02-1.4572-03 3.3435-04 6.8510-04-1.3561-03 2.1095-04 7.1982-04
 8.1312-04 1.9492-04 6.2370-04-7.0713-04-8.9106-05-6.6626-04-2.5105-04 1.0089-03
 1.5769-03 8.7792-04 7.6464-04-7.5278-04-5.8657-04-1.5434-04 6.1898-04-1.9866-03
-4.0516-04-1.3713-04 2.2986-04 2.6223-04-1.6214-03-3.4156-04
SINE COEFFICIENTS
 2.7897-02-8.1992-04 1.5351-03-9.7345-04 1.8917-03-1.2602-03-3.4635-05-1.8352-03
 9.6371-04-1.6812-03 4.7364-04-1.0821-03 1.5935-04-1.0532-03 8.5260-04-9.8078-04
-2.9040-04-3.9777-04-3.3435-04 1.6624-03 1.0366-03-5.7695-04-5.4119-06 9.3844-04
 8.5986-04 6.8951-04-1.1016-03 3.7871-05-3.1104-04-7.4194-04
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TABLE VI - Continued

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SPAN 2  CHORD 1        STEADY#  4.3369800
COSINE COEFFICIENTS
 3.1971-02 1.2778E00 1.8152-02 2.0998-01-1.4152-01 2.3404-01-1.6243-01 4.2499-02
-1.1443-02 4.9020-02-9.5116-02 4.9124-02-2.3611-02 4.5393-03-3.0236-02-4.4193-03
 1.8607-02-5.4000-03-8.3990-03 1.8697-02 1.4655-02-4.3092-02 5.1082-03 3.0937-02
-3.3112-02 3.6613-03 2.6416-02-2.2412-02-8.7200-03 2.2042-02
SINE COEFFICIENTS
 2.9122-01 8.2917-01-1.2647-01-2.0071-01-1.4389-01 4.7232-02-1.5237-01 5.5325-02
 7.6180-02-6.4444-02-2.7330-02 3.8587-02 4.8149-03-7.5083-02 6.9719-02-2.8547-02
-3.8408-02 2.9372-03 3.7969-02-3.4068-02 6.6259-03 3.4009-02-2.5070-02-1.0991-02
 2.0115-02-1.6927-02 8.5356-03 3.8836-03-2.5492-03 7.8574-03
SPAN 2  CHORD 2        STEADY#  1.7781800
COSINE COEFFICIENTS
 1.1152-01 5.3741-01 3.4295-02 5.6679-02-5.1116-02 9.6608-02-6.3626-02 1.3644-02
 1.6266-02 4.2510-03-2.4152-02 7.6185-03-1.4163-03-4.9509-03 4.2733-03-2.6632-03
 1.5270-02 4.2269-03 6.7367-03-2.1888-03 1.0479-02-1.1903-02 5.7414-03 8.2134-03
-4.4553-04-3.6114-03 5.3567-03-6.9034-04-1.5886-02 4.4130-03
SINE COEFFICIENTS
-3.3236-02 3.0270-01-2.6599-02-9.9732-02-6.3050-02 1.5423-02-4.1935-02 1.6489-03
 3.8250-02-2.5269-02-6.1523-03 1.3715-02 3.0279-03-2.2242-02 1.7617-02 4.3942-04
-1.1435-02-3.8535-03 6.2118-03-9.3384-03-8.2163-04 4.5082-03-5.9924-03-1.0948-02
 7.7840-03 1.0668-03 5.5400-03 7.4888-03-4.1963-04-2.3107-04
SPAN 2  CHORD 3        STEADY#  1.4212800
COSINE COEFFICIENTS
 7.3731-02 2.8196-01 1.7839-02 2.6598-02-2.8872-02 4.6280-02-1.9594-02-4.6127-03
 8.8809-03 8.6577-04-6.4897-03-3.4441-03 1.2193-03-2.0129-03-1.3506-03-1.1267-03
 4.6765-04-4.4043-04-2.6228-03 4.7920-03 1.7536-03-5.5452-03-4.3822-03 4.0152-03
 2.2755-03-3.3496-03 1.7567-03 7.8990-04-2.3201-03-1.4481-03
SINE COEFFICIENTS
 1.1471-01 1.4698-01 3.1271-03-5.7119-02-3.8920-02-6.1768-04-6.1656-03 1.0122-03
 1.1292-02-3.7559-03-3.2692-03 1.7541-03 1.7847-03-2.8290-03-2.3786-03 9.9194-04
-3.5016-04 8.3542-04 7.0164-04-1.5368-03-1.7970-03-5.0048-03 3.8131-03 2.3268-03
-1.3726-04 6.7708-04 1.6535-03-3.5654-03 8.7553-04 1.5803-03
SPAN 2  CHORD 4        STEADY#  3.3088-01
COSINE COEFFICIENTS
-1.2912-01 2.1027-01 4.0753-02 1.6216-02-1.4254-02 1.9773-02-3.8320-05 4.2727-03
 3.1920-03 5.5747-04 3.5748-03-6.3172-03-8.4391-04 2.3443-03-8.8825-04-3.7812-03
 4.3955-04 3.1797-04-1.9360-03-1.3080-04 2.2508-03 1.1907-03 1.4440-04-7.0511-04
-1.4327-04-9.4458-04-6.6669-04 2.3604-03-1.5813-03 5.2424-04
SINE COEFFICIENTS
-1.4707-01 3.2591-02-1.5018-02-3.2793-02-8.9613-03-2.0016-03-1.8730-03-2.9986-03
 1.4064-03-1.3956-03-4.5706-05 1.9180-03-1.4255-04 7.8103-04 3.1734-04 1.9517-04
-1.0639-03-8.5334-04-1.6158-03 1.3332-03-1.0074-03-2.8231-04 3.2077-03-2.4423-04
-4.0421-03 2.1967-03 2.9039-04-1.2905-03-1.2245-03 1.0155-03
SPAN 2  CHORD 5        STEADY# -1.8261-01
COSINE COEFFICIENTS
-1.0157-02 6.0845-02 1.3514-02-2.0794-03 3.2263-03 3.2181-03 2.4555-03 2.7304-03
 1.1535-03-1.3184-03 2.6684-03-1.8225-03-6.3885-04 1.1343-03 1.5786-03-1.6936-03
-2.4161-03 1.1687-03-1.7009-03-2.2426-04 9.4610-04 2.3763-03-1.2171-03 1.7690-04
-1.8600-03-5.8504-04 1.3804-03 4.8941-04-3.6066-03 3.5744-04
SINE COEFFICIENTS
-1.9732-01 2.6981-03 6.4492-05-9.0351-03-7.6550-04 2.8004-04-2.0594-03-6.0049-04
-2.0468-04-3.9396-04 2.6800-04 2.1120-03-2.6579-03 9.3080-04 8.1560-04 1.6318-03
-1.6955-03-9.6011-04-2.4909-04 7.4565-04-1.4359-03 1.3820-03 2.1315-03 3.0637-04
-3.7379-04 3.0158-04-3.4333-04 8.3474-04-1.8071-03-8.1700-04
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TABLE VI - Continued

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SPAN 3  CHORD 1          STEADY#  5.0507&00
COSINE COEFFICIENTS
 1.3825&00 1.4887&00 2.0795-01 3.3733-01-8.4563-02-7.5254-02 1.0298-01 9.5053-02
-1.0873-01 8.0426-03 1.6649-02 1.1028-02 1.9801-02-5.2045-02 7.1535-03 6.9338-02
-3.9317-02-4.3481-02 7.0216-03 3.5059-02 2.0833-02-5.0134-02 1.5528-02 7.4299-02
-4.2241-02-1.6495-02 4.0336-02-1.1366-02-1.6290-02 1.9028-02
SINE COEFFICIENTS
 3.5130-02 7.6023-01 3.6147-01-4.1125-01-2.2360-01 1.6466-01-5.7856-03 1.1243-02
-4.4100-02 7.0492-02 9.6403-02-8.7833-02-2.6169-02 9.8243-02-1.3585-02-2.4986-02
-1.4871-02 1.0954-04 2.3095-02-2.5992-02-1.3153-02 3.1106-02-2.4709-02 1.7944-02
-7.6730-04-4.5543-02 3.0891-02 2.9048-02-3.5640-02-1.5040-02
SPAN 3  CHORD 2          STEADY#  4.0409-01
COSINE COEFFICIENTS
 6.8430-01 5.3477-01 9.5445-02 6.5512-02-4.6863-02 1.4313-02 7.6625-02-4.0569-03
-3.9311-02 1.5397-02-3.9268-03 3.1078-03 9.5746-03-3.4076-03-1.0546-02 1.6768-02
 8.5805-03-1.3061-02-2.5410-04 1.2079-02-1.2601-03-1.1347-02-1.6089-03 1.3397-02
 9.9320-03-1.9556-02 1.0915-02 1.2587-02-1.9495-02 6.0499-03
SINE COEFFICIENTS
-8.9359-01 2.0829-01 1.1949-01-1.3544-01-1.2517-01 3.4570-02 2.4287-02 4.5061-03
-4.7514-02 2.4927-02 3.6571-02-3.5545-02-2.0617-02 3.7014-02 1.1435-02-2.9137-02
 3.4840-04 1.9700-02 1.6227-03-1.1384-02 1.8387-03 1.0095-02-5.1355-03-1.1267-02
 8.5299-03-2.7107-03-1.0062-02 1.4591-02-8.3661-03-1.5835-02
SPAN 3  CHORD 3          STEADY# -4.7725-01
COSINE COEFFICIENTS
 1.6359-01 3.1865-01 6.7634-02 5.8930-02-4.6773-02 2.2593-02 2.8200-02 1.7343-03
-2.1223-02 2.9836-03 3.8672-03-7.5031-04-2.3782-03 7.4298-03-8.0009-05 1.1662-03
 8.2075-04-2.6886-03-9.1639-04 6.5657-03-1.7947-03-2.8967-05-1.5389-03-1.5790-03
 3.2173-03-5.6018-03-2.5344-03 5.5606-04-4.7637-03-7.0705-03
SINE COEFFICIENTS
-3.5439-01 6.7284-02 3.8961-02-8.3471-02-6.6631-02 1.8657-02 2.6183-02-1.9549-02
-2.9205-02 1.3423-02 2.2423-02-1.9500-02-2.0026-02 1.4430-02 9.2772-03-1.3679-02
-4.9926-03 8.4765-03 2.3426-03-2.8698-03-6.0585-03 1.0650-03 1.9672-03 1.8535-04
 1.3506-03 6.0493-03 4.0716-03 6.3753-03-1.2420-03-3.9130-03
SPAN 3  CHORD 4          STEADY#  8.5327-02
COSINE COEFFICIENTS
-2.7656-03 1.5432-01 4.2404-02 2.4767-02-2.7521-02 1.4746-02 1.2704-02 5.2493-03
-6.5127-03 8.4618-04 2.7522-03 1.5979-03-3.1963-03 4.3252-03 3.4195-03-1.9140-03
-2.0756-04 2.1873-03 2.6159-03-4.0909-04-2.4211-03-1.4815-03 7.1173-04 2.0608-03
-3.2587-04-2.7828-03 4.0690-04 9.1374-04-1.1366-03-1.9378-03
SINE COEFFICIENTS
-2.3629-01 8.8615-03 1.6114-02-3.3094-02-2.4174-02 3.2137-03 7.0870-03-5.5177-03
-6.6973-03 4.1160-03 4.8944-03-3.9296-03-3.5107-03 1.5104-03 3.9681-03-4.5451-03
-2.2527-03 3.1904-03 3.1383-03-2.2344-03-3.5350-03 4.9108-04 1.8946-03 6.2991-04
-5.8595-04 7.8155-04 2.2486-03 1.1114-03-3.0599-03 4.7690-04
SPAN 3  CHORD 5          STEADY# -1.3263-01
COSINE COEFFICIENTS
-8.1742-04 3.9968-02 1.0075-02 2.3009-03-7.6032-03 5.1107-03 2.6942-03 2.6633-03
-1.0593-03-7.5843-05 3.0317-03 1.5458-03-3.2164-03 2.0615-03 2.3286-03-2.3404-04
 3.5013-04 1.1926-03 2.4263-03 1.5200-03-1.7784-03-5.4583-04-7.1053-04 1.1878-03
 2.2535-03-2.8043-03-1.8661-03 1.9203-03 1.4336-03-1.5174-03
SINE COEFFICIENTS
-1.3713-01-8.1253-04-2.7859-03-8.7348-03 5.0472-04 6.1089-04-2.1385-04-7.0121-03
-1.9903-03 1.1375-03-1.3745-03-9.6906-04-8.7485-04-8.6024-04 3.9617-04-2.5718-03
-2.0286-03 1.6314-03-5.2252-04 1.1781-03-7.0512-04-1.2377-03 3.2895-03 4.4722-04
-3.6540-04 2.2224-03 8.7697-05 1.7153-03 1.3401-04-9.9605-04
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TABLE VI - Continued

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SPAN 4  CHORD 1        STEADY#  4.2952800
COSINE COEFFICIENTS
 1.8536800 1.2335800 3.9149-01 4.2753-01-1.1638-01-7.8775-03 6.9343-03-9.3482-02
 7.5327-02 1.0116-01-1.0726-01-9.3537-02 1.0206-01 8.4530-02-6.6670-02-3.7490-02
 5.2527-02-8.9999-04-8.6916-03 4.7046-02 1.534.-02-5.9711-02 4.0849-03 6.4836-02
-3.4622-03-4.8006-02 1.1006-02 1.5705-02-2.4635-02-7.3539-03
SINE COEFFICIENTS
-1.3172800 6.5611-02 1.6336-02-6.5811-02-3.9929-01-1.430)-01 1.7707-01 9.4212-02
-1.3689-01-6.0306-02 6.7223-02-6.8443-03-4.4512-03 5.5608-02-6.1071-03-6.3466-02
 4.3396-02 7.0812-02-4.0524-02-5.5426-02 3.6465-02 3.1858-02-4.3465-02 6.0099-03
 2.3735-02-2.2832-02-2.4533-02 4.4709-02 1.2455-02-5.4263-02
SPAN 4  CHORD 2        STEADY#  1.2251800
COSINE COEFFICIENTS
 1.1089800 5.2594-01-1.0604-03 7.2270-02-1.0684-01 5.8568-02 1.2274-01-1.0872-01
-2.7636-02 1.3152-01-4.9052-02-9.7978-02 7.2057-02 4.0398-02-3.9863-02 6.4594-03
 1.1057-02-6.5010-03 3.6015-03 2.4519-03-3.0932-03-1.2863-02 7.5564-03 1.2587-02
 7.7552-03-1.6340-02-1.3497-02 2.2080-02 2.0005-03-2.1014-02
SINE COEFFICIENTS
-7.8936-01 2.1314-01 1.5544-01-6.8080-02-2.3111-01-1.6550-01 1.2726-01 1.4484-01
-1.4973-01-6.7204-02 1.0948-01-2.7839-02-3.6652-02 4.6162-02-2.8155-02-2.2272-02
 3.4743-02 1.5989-02-7.7223-03-1.7975-02 3.3888-03 3.3454-03-8.5269-03 1.3996-03
 5.8801-03 5.3757-03-1.7082-02 6.3400-03 2.0699-02-9.7273-04
SPAN 4  CHORD 3        STEADY#  7.7701-01
COSINE COEFFICIENTS
 4.7931-01 2.0347-01 6.3908-02 2.5102-01-6.9436-02-1.7388-01 6.5778-02 1.0836-01
-2.9315-02-2.3238-02 1.8195-02-4.1148-02-3.3685-02 7.2172-02 4.9140-02-7.2268-02
-5.8547-02 5.6758-02 4.4540-02-3.6368-02-3.0902-02 2.7915-02 1.9453-02-1.2721-02
-1.0769-03 1.3716-02-5.6426-03-2.8800-04 1.2450-02-1.0966-03
SINE COEFFICIENTS
-4.9547-01-4.1103-04-9.6728-02-1.5278-02 6.9970-02-8.1615-02-1.1203-01 9.2733-02
 5.5419-02-7.3241-02-3.4181-04 4.7107-02-3.8135-02-5.2091-02 5.0253-02 5.3279-02
-5.9834-02-3.7669-02 4.9806-02 2.8026-02-3.8056-02-2.0822-02 2.3625-02 9.7217-03
-1.8103-02-5.5202-03 1.0336-02-4.2560-03 2.1469-03 1.6204-02
SPAN 4  CHORD 4        STEADY# -2.2087-02
COSINE COEFFICIENTS
 1.0859-01 1.3646-01 3.0952-02 3.0192-02-1.4019-02 2.1162-03-1.2077-03 7.3941-03
 4.7135-03-2.1719-03-1.3938-03-4.4921-04 1.1047-04 8.8793-03 6.5663-03-1.6713-03
-3.1954-03-1.6708-03 2.0437-03 4.9662-03 1.3639-03-3.8855-03-2.1956-05 4.3195-03
 4.1150-03 2.7414-03 2.2242-04 5.0265-04 2.1049-03 2.1103-03
SINE COEFFICIENTS
-4.2102-01-1.7455-02 3.5328-02-1.2316-02-3.2147-02-1.0142-02 5.3367-03 1.4980-02
-1.5251-03-1.5836-02-1.0944-03 3.9562-03 4.7768-03-2.7156-03-1.4131-03-3.1612-03
-8.2878-04-1.6031-04-9.2841-04-3.5971-03-1.0976-03-2.0935-03-1.5038-03-8.3129-04
 4.8809-04 2.9100-04 4.8950-04 4.8653-03-1.8501-03 6.4888-04
SPAN 4  CHORD 5        STEADY# -4.6603-01
COSINE COEFFICIENTS
-5.5083-02 1.9809-02 4.8924-03 1.5942-03-6.0462-03 2.0988-03-1.8528-04-1.0917-03
 5.4968-05-1.0932-03 1.2262-03-1.3988-03-8.3719-04-8.9749-05-3.3046-04-4.1880-03
 1.3230-03 7.1504-03-8.3628-04-9.8319-04 5.1404-03-2.0614-03-5.0099-03 1.4341-02
 1.0015-02-6.1898-03 5.8831-03 2.8552-03 1.7634-04 1.1440-03
SINE COEFFICIENTS
-1.8313-01-1.9897-02 1.5545-02-1.4822-03-4.5674-03 2.6134-03-1.4022-03 4.5563-04
-6.5550-05-6.4057-04 2.4049-03 3.0640-03 1.7130-05-3.3681-03 6.5196-04 3.0163-03
-4.5565-04 3.6142-04 5.8697-04-1.7254-03-5.4098-04 2.5244-03 3.1115-03 2.0554-08
-4.3076-03-3.0440-03-4.2146-04 2.2482-03 3.9253-03 8.5428-04
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TABLE VI - Concluded

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SPAN 5  CHORD 1          STEADY#  5.5355&00
COSINE COEFFICIENTS
 1.7702&00 9.6457-01 4.3684-01 5.1700-01-8.6165-02-2.4677-02 1.5004-01-4.8647-02
-7.6347-02 1.4419-01 1.3188-01-1.1365-01-1.3679-01 1.8044-01 1.3396-01-7.4896-02
-1.1811-01 3.9097-02 7.8559-02-3.7032-02-5.9939-02 1.4020-02 1.0049-02-4.2602-02
-5.9943-03 4.7380-02 1.5408-02-5.9892-02-1.4282-02 4.1499-02
SINE COEFFICIENTS
-8.4892-01-1.6435-02-9.0069-02 2.6235-02-2.5214-01-3.3542-01 7.3775-02 2.3425-01
-8.0568-02-2.8843-01-2.8654-02 6.8463-02-6.5512-02-5.8847-02 1.1408-02 1.8582-02
-9.8569-02-1.1167-01 4.6765-02 2.8489-02-1.1140-01-9.9674-02 3.5252-02 2.5035-02
-4.7178-02-3.1878-02 2.9547-02-5.9813-03-4.8932-02 1.4649-02
SPAN 5  CHORD 2          STEADY#  1.0080&00
COSINE COEFFICIENTS
 1.2178-01 1.2419-01 1.1673-01 1.3068-01-8.3871-02-2.8732-02 2.6044-02-1.8721-03
 2.1801-02 4.4887-03-1.3124-02-1.8110-02-9.1779-03 1.5274-02 4.0659-02 8.5122-03
-3.8745-02-3.1559-02 1.6871-02 3.6405-02 8.6553-03-2.6279-02-1.2065-02 1.4952-02
-1.3692-04-7.7852-03 4.8408-03 1.2397-02-1.0455-02-1.3265-02
SINE COEFFICIENTS
-1.6315-01-9.1100-02-4.3247-02 5.5817-02-7.4307-02-9.4477-02 7.1223-04 5.6727-02
 1.7233-02-2.4632-02-2.1311-02 4.0869-03 1.5696-02-1.5714-02-1.2315-02 1.8354-02
 1.6315-02-1.5021-02-2.2217-02 8.0433-04 1.3455-02 1.1234-03-1.7567-02 4.7419-03
 1.6258-02-1.1028-02-1.7076-02 7.4741-03 1.8364-02-3.5750-03
SPAN 5  CHORD 3          STEADY#  1.7249-02
COSINE COEFFICIENTS
-1.0366-01 1.8006-01 1.1431-02 8.7741-02-2.9480-02-2.2487-02 2.6913-03 4.8785-03
 6.8663-03 7.3962-03-8.4026-03-1.0679-02 5.7514-03 2.2101-03 4.6348-03 2.3739-03
-3.7847-03-1.4138-02 6.2791-03 8.6512-03 1.4459-03-3.2548-03-3.1093-03 1.6579-04
 3.5646-04 1.8438-03-1.0066-03-7.7171-05-6.3023-03-2.4030-03
SINE COEFFICIENTS
-7.7471-01-1.3476-02 2.2156-02 5.8632-03-3.8852-02-2.8488-02-1.2810-02 4.3435-02
 1.2978-02-2.0537-02-1.3935-02-5.6497-03 1.9071-02 7.7844-03-1.1537-02-1.2044-02
 7.1623-03 1.6741-03-3.5752-03 2.3236-03-5.3038-03-3.4431-03-6.6140-04 4.8806-03
 4.3300-04-1.3205-03-5.8378-03 4.5584-04 1.9017-03 1.6856-03
SPAN 5  CHORD 4          STEADY# -1.4542-01
COSINE COEFFICIENTS
-3.0921-01 1.9918-02-1.7579-03 1.6344-02-4.7683-03 1.7596-03-1.1114-02-4.1561-03
 1.0336-02 2.0821-03-6.0677-03-5.3122-03 1.9346-03 8.8618-04 1.0530-03 7.1449-04
 1.4586-03-4.0434-03-3.7446-03 2.7397-03 4.9736-03-4.1642-05-3.4761-03-1.8090-03
 8.1934-04 1.2032-03 1.1563-03-2.2394-04-2.0891-03-1.1739-03
SINE COEFFICIENTS
-2.1462-01-2.5651-02 2.2966-02-5.1896-04-2.0851-02-1.8738-03-5.2562-03 7.8901-03
 8.8554-03 2.3363-03-5.7113-03-6.3453-03 3.5120-03 6.8024-03-1.7679-03-6.0399-03
-1.2454-03 3.9690-03-1.0601-03-9.6680-04-3.8801-04 1.3775-03 3.9508-05-1.9283-03
 1.9142-03 6.7271-04-8.4929-04-3.0162-04 4.4893-04 1.2552-03
SPAN 5  CHORD 5          STEADY# -3.9769-01
COSINE COEFFICIENTS
-1.2862-01-1.9108-02-4.2228-03 6.3179-03-2.6947-03-2.5637-03-1.6692-02-2.7261-04
-2.9621-04-3.8906-03-1.9882-03-3.2191-03-1.2603-02 1.7977-02 7.3915-03 3.5082-03
-3.5391-03-2.3979-03-4.2294-03 6.1334-03-3.0402-05-8.3412-04 1.9567-03-2.2209-03
-2.7220-03 1.5626-03 3.3443-03-1.2406-03-6.7444-04-4.2403-04
SINE COEFFICIENTS
-2.0137-01-1.4110-02 1.8727-02 1.9274-02-6.1960-03-2.1404-03-1.0131-02 1.0137-02
 1.8058-02 4.4379-03-4.8086-03 6.5606-03 2.1006-02-3.4644-02-9.9011-03-5.6664-03
-4.2575-03-6.9436-03-5.0682-03 4.6512-03-1.6667-03-4.4194-03-3.2754-03-2.6321-03
-2.1823-03-4.1239-03-1.4507-03-2.8976-03-7.3468-03-3.3138-03
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TABLE VII. AERODYNAMIC DATA - 140-KNOT, EAST-TO-WEST FLIGHT

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BURST NO. # 16              *** ROTOR NOISE PUNCHED OUTPUT ***
BLADE PITCH HARMONICS
 1.2660&01 3.5189&00-5.4378&00  *COLLECTIVE, LONGITUDINAL, LATERAL RESPECTIVELY*
ROTOR FLAPPING ANGLE HARMONICS
 1.8056&00-2.4824-01-7.6813-02  *POSITIVE TAIL HIGH -- DEGREES*
DIFFERENTIAL PRESSURE HARMONICS FOR 5 CHORD STATIONS AT EACH OF THE 5 SPANS
*MEASURING FROM THE LEADING EDGE AND THE BLADE ROOT RESPECTIVELY*.
SPAN 1  CHORD 1          STEADY*  1.5717&00
COSINE COEFFICIENTS
-1.0399&00 7.5633-01-3.7464-01-4.1783-02-1.0663-01 7.4181-02-7.3632-02 3.7777-02
-2.9714-02 3.2592-02-2.5193-02 6.1458-03-2.8729-02 5.9236-03-2.0129-02 1.3137-03
-1.2622-02 5.5308-03 2.4149-03 1.8297-05-1.6873-03 9.3427-03-3.5102-03-1.1375-03
-7.6830-03-3.4986-03-2.9614-03-8.7449-03-4.5212-03 7.9618-03
SINE COEFFICIENTS
 5.7542-01-6.4825-03 3.0207-01 3.2483-02-6.8737-02 5.5362-02-6.7961-03 1.9779-02
-1.3582-02 8.1893-03-7.7728-03-1.0863-02-1.5824-02-2.0059-02-4.7943-03-2.1894-02
-5.9257-03-2.7471-02-1.3277-02-1.8856-02-2.2521-03-1.5816-02 6.5961-03-7.9315-03
 4.3151-03 4.0255-04 6.0884-03 1.5587-02-7.5364-04-2.4154-03
SPAN 1  CHORD 2          STEADY*  5.5893-01
COSINE COEFFICIENTS
-3.2250-01 2.4744-01-1.2910-01-1.4341-02-3.9860-02 1.0190-02-3.9342-02-7.7715-03
-1.3762-02 9.0389-03-4.0694-03-1.9648-02-1.4714-02 1.6614-02 1.3429-03-1.1911-02
-2.1694-02 2.4592-02 9.3097-03-5.3578-03 1.6177-02 3.2004-03-2.5141-03-4.1192-03
-5.1289-03-3.2618-03 3.1328-03-2.3456-02-2.2754-03-1.4139-03
SINE COEFFICIENTS
 3.2079-01-2.3804-02 1.0925-01-1.5871-02-7.9892-03 2.1819-02-1.3650-03-1.5377-02
-1.7598-02-2.1815-02-8.7594-04-7.1410-03 [illegible]0563-02 2.3375-03 3.0391-03-1.2647-02
 1.7237-02 3.8285-02 1.1167-02-1.9953-02 1.10[illegible]-02-1.3840-02 9.5293-03 1.3605-03
-1.7750-02 1.1535-02-1.5677-02 2.4617-02-2.3343-02 [illegible].8343-03
SPAN 1  CHORD 3          STEADY*  2.5193-01
COSINE COEFFICIENTS
-2.2264-01 1.8897-01-8.0707-02-2.4400-02-2.3587-02 1.5721-02-9.4920-03 8.8229-03
-4.2383-03 8.7480-04-6.2239-03-2.3416-03-5.2135-03-5.3529-04-2.7656-03-2.2199-03
-3.8170-03 4.9137-04-1.5779-03 1.0264-03-1.1525-03-4.2563-04-1.5525-03-3.2430-03
 3.9779-04 4.6939-04 3.2734-03 2.4731-03 2.4884-03-3.6194-03
SINE COEFFICIENTS
 1.5354-01-4.3676-02 5.2738-02 2.4771-03-1.5151-02 5.6092-03 4.8906-03 2.5545-03
-4.1595-03-1.1162-03-1.6245-03-3.3369-03-5.2894-03-3.1826-03-4.8466-03-5.7059-04
-4.2043-03-4.0674-03-7.2478-03-2.1026-04-4.6259-03-1.3689-03-2.3447-03 5.2117-04
-4.7201-0[illegible]-2.2723-03 2.2204-03-4.1802-03 1.0681-04 1.4969-04
SPAN 1  CHORD 4          STEADY*  0.0000
COSINE COEFFICIENTS
 0.0000    0.0000    0.0000    0.0000    0.0000    0.0000    0.0000    0.0000
 0.0000    0.0000    0.0000    0.0000    0.0000    0.0000    0.0000    0.0000
 0.0000    0.0000    0.0000    0.0000    0.0000    0.0000    0.0000    0.0000
 0.0000    0.0000    0.0000    0.0000    0.0000    0.0000
SINE COEFFICIENTS
 0.0000    0.0000    0.0000    0.0000    0.0000    0.0000    0.0000    0.0000
 0.0000    0.0000    0.0000    0.0000    0.0000    0.0000    0.0000    0.0000
 0.0000    0.0000    0.0000    0.0000    0.0000    0.0000    0.0000    0.0000
 0.0000    0.0000    0.0000    0.0000    0.0000    0.0000
SPAN 1  CHORD 5          STEADY*  1.1633-01
COSINE COEFFICIENTS
 9.8842-03-3.6420-02 7.6790-04 3.6568-04-1.1146-03-1.3476-03-4.6976-04-1.1290-03
-1.0044-03-1.1146-03-4.6778-04 1.2949-04 1.3712-04-4.1319-04-4.9333-04 9.0107-04
 7.2940-04 1.1592-03 9.7980-04-3.1639-04 1.3490-04-3.2772-04-7.3254-05 9.0275-05
-3.7497-04-4.9621-04 7.1931-04-3.0896-04 1.0414-03 4.8562-04
SINE COEFFICIENTS
 4.9724-02 8.6151-03 3.9729-03-1.3977-03 1.6336-03-1.4067-03-3.8740-04-1.1129-04
 3.1683-05-1.0185-03 5.8690-04 6.9941-04 1.8522-03 7.5606-04 1.9254-03-1.0231-03
 1.6802-03 6.4488-04 2.5144-03-6.8592-04-5.3402-05 3.2903-05-6.0223-04 1.5642-04
-2.1190-04-1.266[illegible]-03-8.1897-05-7.4128-04-7.1469-04 1.0421-03
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TABLE VII - Continued

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SPAN 2  CHORD 1        STEADY=  4.5323+00
COSINE COEFFICIENTS
-1.7940-01 1.7619+00-3.7789-01 3.5856-01-2.3206-01 1.4205-01 5.2186-02-1.5252-01
 8.2101-02-1.1951-01 8.7269-02-9.2070-02-7.2593-03 1.9484-02-5.0856-02 4.2 22-02
-6.1884-02 4.9378-02-2.7763-02-2.8632-02 2.0482-02-5.0281-02 1.9937-02-5.0475-02
 1.7240-02-5.8386-03-2.7221-02 1.8571-02-3.2158-02 2.1056-02
SINE COEFFICIENTS
 3.8236-01 3.8532-01 2.4026-01-6.2043-01-3.4437-02-1.8838-01 1.1593-01-1.7658-01
 3.8184-02-1.2526-02-9.8332-02 5.4902-02-9.0934-02 6.0470-02-8.2695-02-5.2664-03
 2.8870-03-5.6567-02 3.9640-02-5.3495-02 2.7394-02-2.7976-02-1.7737-02 6.5670-03
-4.7008-02 2.4239-02-4.0531-02 1.8312-02-1.6535-02-9.7951-03
SPAN 2  CHORD 2        STEADY=  1.8513+00
COSINE COEFFICIENTS
 4.5741-02 7.1327-01-1.0328-01 1.0908-01-7.8798-02 4.9984-02 2.1732-02-6.5278-02
 2.0718-02-1.6030-02 9.3353-03-1.2599-02-1.7281-02 7.2092-03-1.5112-02-1.3006-03
-5.1626-03 8.5096-04 3.4789-03-2.1151-02 1.2033-02-5.7802-03 4.0308-05-8.2477-03
-1.7554-03 3.9107-03-1.6404-03-4.5673-03-6.1434-03-5.6874-03
SINE COEFFICIENTS
-4.2244-02 1.2124-01 1.0374-01-2.7166-01-3.4589-02-4.7420-02 3.6124-02-4.6882-02
-9.5801-03 8.4860-03-3.7532-02 1.2442-02-1.2368-02 4.5665-03-1.6033-02-5.9656-03
 8.4553-03-2.4288-02 2.2579-02-1.2442-02-5.3551-03-6.0635-03-7.8602-03-2.1799-03
-1.5682-02 1.5542-03 1.7302-03-1.9262-03 2.0578-03-7.4908-03
SPAN 2  CHORD 3        STEADY=  1.4711+00
COSINE COEFFICIENTS
 2.4704-02 3.6126-01-4.4450-02 3.6962-02-4.1617-02 3.4132-02 1.4042-02-2.6245-02
-5.8314-03-1.3758-03 1.0822-03-1.0352-02-6.1856-03 3.8450-03-4.8402-03-7.2371-03
 2.1947-05-6.9575-04-5.8525-03-6.8766-03 1.8852-03-3.1694-03-4.0915-03-2.3305-03
-6.5034-03 1.1054-03-4.4736-03 1.8706-03-5.0403-03-9.1576-04
SINE COEFFICIENTS
 1.5842-01 4.5420-02 7.1085-02-1.3907-01-3.1719-02-1.1048-02 3.0212-03-1.3924-02
-1.3689-03-5.3495-03-1.3400-02 3.2802-03-9.3908-04-1.8944-03-5.4201-03-5.3817-03
 2.8228-03-1.9468-03-3.0780-03-2.7200-03 1.5915-04-5.9690-04-2.1446-03-1.4655-03
-3.0303-03-6.6307-03-7.1154-03-1.8214-03-8.8891-04-2.1607-03
SPAN 2  CHORD 4        STEADY=  3.3822-01
COSINE COEFFICIENTS
-1.9818-01 2.6690-01 1.5157-02 1.3185-02-2.6935-02 1.7451-02 1.1716-02-4.0181-03
-9.1603-03 4.5397-03 7.8183-04-3.6246-03-5.1278-03 1.4103-03 1.1162-03-6.7983-03
 3.0550-04-2.3217-03 1.3382-03-3.6719-03 7.9875-04 2.7478-04-2.5723-03-3.1964-03
-4.1691-03-2.3562-04-2.2709-03-8.7881-04-2.6000-03-4.3432-04
SINE COEFFICIENTS
-1.9410-01-3.1865-02 7.1949-03-7.2241-02-8.4870-03-5.4846-03-9.8401-03-3.7830-03
-4.8302-03-5.3166-03-4.4687-03-8.3279-04 2.5732-03-3.8840-03-3.4916-04-3.5617-03
-5.7262-04-2.7812-04-3.7568-03-1.4458-03-1.0140-03 1.0643-03-1.4649-03-2.1168-03
-2.8634-04-4.2956-03+3.4196-03-2.9870-03 1.5834-04-3.7106-03
SPAN 2  CHORD 5        STEADY= -2.1155-01
COSINE COEFFICIENTS
-2.9914-02 7.7471-02 9.5966-03-8.5501-04-6.0925-03 4.0236-03 1.9076-03 1.5176-03
-4.3965-03 5.0761-03-9.5919-04 2.9989-04-1.5374-03 3.2433-04 2.9475-03-5.8954-03
 9.0923-04-1.2299-03 2.8499-03-2.3609-03-2.1797-03 2.3583-03 1.5863-04-4.8643-04
-3.2080-03 1.5213-03 1.0327-03-2.0041-03-5.3994-04-1.5626-03
SINE COEFFICIENTS
-2.4154-01-4.5372-03-7.2578-03-1.2976-02-6.1165-04 7.4773-04-5.9536-03 1.4214-03
-9.5814-04-4.2210-04-1.0184-04-3.2805-03 1.9857-03-4.0377-03 1.3338-03-4.8830-04
-9.9125-04 1.9618-03+3.5592-03 2.8514-03-1.7683-03 8.1225-04-9.6392-04-6.8936-04
 1.2423-03-1.2970-03 1.7130-03-1.9580-03 1.5034-03-9.9697-04
```

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SPAN 3  CHORD 1        STEADY=  5.0899+00
COSINE COEFFICIENTS
 1.4138+00 2.1062+00-9.6492-02 2.1610-01 1.3195-02-1.3131-01-4.7121-02 1.3861-01
-6.6271-02-7.5611-02 6.7105-02-8.4713-02-2.5270-02 2.2284-02-1.0220-01-1.5459-02
 5.3233-02-8.8177-02 6.6572-03 3.4897-02-4.6769-02 2.4652-02 2.6807-03-4.8205-02
 1.3893-02 1.0124-02-4.9997-02 2.3050-02-1.3123-02-3.3012-02
SINE COEFFICIENTS
-2.8365-01 2.9484-01 5.5342-01-6.8690-01-3.0563-01 1.3176-01-1.1214-01-1.6008-02
-6.5277-03-1.2223-01 2.8109-02 2.7001-02-1.2797-01 6.9192-03 3.6768-02-9.2376-02
 1.9832-02 2.4649-03-6.6605-02 4.3095-02 4.2520-06-4.3883-02 3.4607-02-1.2844-02
-5.6925-02 2.9227-02-4.0928-02-3.3545-02 1.4907-02-3.3766-02
SPAN 3  CHORD 2        STEADY=  2.0644-01
COSINE COEFFICIENTS
 7.3224-01 9.7440-01-4.1951-02-6.8101-02 2.3821-02-4.9558-02 3.5084-03 5.8280-02
-4.5411-02-2.4172-02 1.8268-02-1.7607-03-1.7963-02 1.6821-03-1.7803-02-1.4357-02
 1.9847-02-2.2879-02 1.4638-02 5.1401-03-1.1363-02-7.2808-03-3.0931-03-8.1221-03
-1.1249-02 1.6539-02-9.9994-03-1.9597-02 1.8293-03-9.8462-03
SINE COEFFICIENTS
-1.3782+00 9.4754-02 3.1306-01-2.8956-01-1.6408-01 3.1926-02-6.8949-02 1.3465-02
-3.8350-03-2.8389-02 1.4671-03 1.0370-02-1.6497-02-1.5657-02 1.4066-02-2.5674-02
-4.3110-03-7.8095-03-2.2010-02 9.5720-03 2.1865-03-7.1203-03-2.2406-03 5.1142-03
-1.4254-02-1.1608-02 1.4152-02-1.0766-02-8.9969-03-5.0944-03
SPAN 3  CHORD 3        STEADY= -2.5086-01
COSINE COEFFICIENTS
 1.0924-01 1.4247-01 6.1491-02 1.9672-01-9.7216-02-5.2597-02 2.4189-02-1.5102-02
 2.8157-02 4.0777-03-3.9904-02-1.0752-02 4.8054-03 9.6268-03 4.2944-03-1.7091-02
-5.9611-03 2.3406-03 1.8043-02-1.0639-03-4.6159-03-3.2004-03-5.8965-03 1.0888-02
 2.9965-03-8.3086-03-1.0052-02-1.1824-03-2.2238-03 4.8815-03
SINE COEFFICIENTS
-5.5620-02-1.0047-01-1.7288-01-9.3416-02 2.9472-02-4.1383-02-2.3998-03-2.5882-02
-4.4848-02 4.5212-02 1.6687-02-2.0263-02-1.9109-02-6.8838-03 2.2457-02 1.0627-03
-1.7648-02-1.8207-02-1.6176-03 1.3676-02-2.6654-03-5.2164-03-1.1699-02-9.3563-03
 9.6920-03 1.5205-03-1.0473-02-4.3639-03-5.2852-03 1.8605-03
SPAN 3  CHORD 4        STEADY= -9.7465-02
COSINE COEFFICIENTS
-1.9503-02 2.2175-01 7.7990-03 1.5428-03-2.0499-02 5.6832-03 1.2824-02-3.2823-04
-7.6758-03-4.7927-03-2.1867-03 2.2179-03-1.8914-03-3.7096-03 6.2222-04-1.4324-03
-2.3804-03 2.9179-03-6.8540-04-2.8700-03 1.2895-03-1.4736-04-1.6370-03 1.2121-04
-8.5362-04 8.0716-04-5.3382-04-1.5172-03-2.3777-03 1.2178-03
SINE COEFFICIENTS
-3.0872-01-4.5429-02 3.8436-02-7.0371-02-3.1469-02-8.3436-03 9.8034-04 1.2894-03
-1.2553-02-2.0839-03 1.2114-03 6.5886-04 6.6393-05-1.3742-03 5.4131-04 1.2721-03
-4.9538-03-3.0933-03 8.0487-04-6.9093-04-3.8331-03-3.4419-04-6.8970-04-4.1992-04
-1.3585-03-2.7404-03-6.7157-04-7.3131-04-1.4734-03-2.2124-03
SPAN 3  CHORD 5        STEADY= -1.4145-01
COSINE COEFFICIENTS
-7.0444-03 5.4987-02 8.3275-03-5.6938-04-6.7115-03 2.5331-03 4.0079-03 6.6472-05
-1.4771-03 1.4513-03-5.6299-04 3.6166-03 1.9017-03-1.7697-03 2.3289-03 6.0481-04
-2.2325-03 2.0083-03-1.6198-03-7.7031-04 1.5405-03-9.5990-04-1.8487-03 3.3569-03
-2.1493-04-9.6803-05 1.6276-03-1.1074-03-1.7796-03 1.9140-03
SINE COEFFICIENTS
-1.6845-01-1.5453-02-7.8643-03-1.4858-02-2.2998-03-4.3885-03-1.1468-03-1.1737-03
-5.0913-03 1.4049-03 5.3881-04-1.2166-03 7.7595-04-2.5135-03-1.8020-03 2.8280-03
-1.6393-03-3.3342-03 3.0618-03-3.5866-04-2.1033-03 6.9886-04-2.2744-03-9.8398-04
 2.5164-03-2.7198-03-2.1794-04 1.3682-04-2.1097-03-7.1681-04
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TABLE VII - Continued

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SPAN 4  CHORD 1        STEADY=  4.3236+00
COSINE COEFFICIENTS
 1.9715+00 1.7273+00 1.4510-01 3.6523-01-1.8989-01-7.0262-02-5.0374-02-8.1551-02
-1.3054-02 2.2191-02-2.7233-02-8.8619-02 3.8543-03 5.8714-02-5.2274-03-4.7682-02
 1.5209-02 2.4863-02-3.2421-02-3.1019-02 7.6739-03-1.2409-02-3.8463-02 1.0477-02
 2.2750-02-8.5650-03-2.8257-02 1.2685-02 5.6627-03-2.9764-02
SINE COEFFICIENTS
-1.7004+00-4.4107-01-1.6725-01-4.0294-01-3.8747-01-1.6028-01 3.3269-02 5.9933-02
-1.0367-01-5.7492-02 2.4667-02 3.2600-02-3.3191-02-2.6417-04 1.0415-03-5.0303-02
-2.5114-02 2.1249-02 1.0795-02-5.2152-02-2.5693-02 2.2832-02-1.0688-02-3.2052-02
-1.8994-03 8.2123-03-2.4198-02-3.3753-02 8.7118-03-3.2610-03
SPAN 4  CHORD 2        STEADY=  1.2050+00
COSINE COEFFICIENTS
 1.2423+00 7.6758-01-1.6780-01 1.1740-01-1.3123-01-9.3285-02 8.9736-02-4.3166-02
 4.7550-02 5.4762-02-5.6047-02-2.5415-02-2.8998-02 5.3950-02 6.4827-03-3.3707-02
 1.6422-02-8.3394-03-4.2393-03-5.1300-03 2.1730-02-1.3131-02-1.7508-02-5.2371-03
 7.1466-03 8.2349-03-7.0405-03 1.2010-02-6.0110-03-1.4993-02
SINE COEFFICIENTS
-9.7625-01 1.0403-01 1.2466-01-2.2126-01-7.3795-02-1.6345-01-4.6459-03 6.9424-02
-9.3400-02 3.4776-02 6.3129-03 7.0378-03-2.1291-02-4.0789-02 2.4843-02-2.8320-02
 7.2172-03 4.7534-03-1.0973-02-2.2262-02-1.6288-02 2.3220-02-1.6970-02-1.0356-02
-2.4989-02 2.3262-04-6.5719-03-2.9085-04 4.6294-03-5.2724-03
SPAN 4  CHORD 3        STEADY=  1.0717+00
COSINE COEFFICIENTS
 4.4963-01 8.3456-02-2.3113-02 1.0889-01 1.7004-02 2.1714-02 1.1169-02 3.4136-02
-1.0639-01-5.3970-02 8.4566-02-9.4600-03 7.3584-02 4.3102-02-8.7931-02-3.8947-02
-5.7450-02 4.5283-02 1.1128-01-2.5284-02 2.1506-03-3.8745-02-5.0018-02 7.3130-03
 1.1933-02 6.1519-02 5.6549-04-3.3694-02-2.1095-02-1.3396-02
SINE COEFFICIENTS
-1.7907-01-1.7007-01-1.5906-01-1.5639-01-9.7307-02 2.1396-02 2.6342-02 9.0315-02
 4.3062-02-1.4499-01-3.7597-02 1.4058-02-2.7820-02 1.0284-01 2.3038-02-2.3830-02
-3.2716-02-1.0252-01 3.1659-02 4.4045-02 4.6705-03 4.4070-02-3.0891-02-3.5992-02
-3.3781-02 2.8668-04 5.4115-02 6.3574-03-9.3105-03-2.6533-02
SPAN 4  CHORD 4        STEADY= -9.9500-02
COSINE COEFFICIENTS
 8.8545-02 2.5226-01 1.7002-02-2.6905-02-2.8211-02-3.2769-03 8.9155-03 5.1615-03
 7.9514-03-1.0162-02 2.5602-03 6.3093-03 1.0036-03-3.8267-03 5.4993-03 6.2450-05
-7.3830-03 5.6060-04 6.7769-03-5.4648-03-1.8509-03-9.0334-04-5.1794-03-4.7395-03
 5.6189-03 7.6473-03-3.1342-03 3.5130-03 6.3448-03-3.7929-03
SINE COEFFICIENTS
-6.0061-01-6.4250-02 7.1578-02-9.5353-03-4.4522-02-1.0975-02-5.4469[illegible]-03
 3.6648-03-2.9450-03-1.2587-02 9.0692-03 1.1790-02-4.9902-03-4.9866[illegible]-04
 1.9772-03-1.0195-02 1.1108-02-4.2796-04-6.5972-03 2.0631-03 4.8269[illegible]-03
-4.3462-03 1.2799-03 4.6337-04-5.8436-03 3.5874-03 2.1539-03
SPAN 4  CHORD 5        STEADY= -5.2357-01
COSINE COEFFICIENTS
-7.9665-02 2.8101-02 9.7941-03-3.3593-03-6.3725-03 1.4941-03 2.8592-03[illegible]4455-04
 1.1706-03 8.0555-04 2.0628-03 2.3176-03 1.6306-03 2.6175-04 2.1273-03 2.1280-03
-1.1364-03 4.8706-03 6.4884-03 3.4328-03-2.6707-03 1.7490-03-1.6357-03 4.9562-03
 1.5034-03 1.4787-03-1.4458-04 5.0410-03-2.3900-03 5.5268-03
SINE COEFFICIENTS
-2.2812-01-3.0271-02 8.6824-03 9.6914-03-4.3660-03 1.0240-03 1.6224-03 2.3124-04
 1.4639-03 3.8227-03-3.3329-03 6.3064-03 4.7951-03-2.8931-03-7.5772-04 6.5209-03
 2.6779-05-2.1302-03-2.1474-03 4.2896-03-2.6924-03-6.7841-03 1.5857-03 6.7580-03
-9.8096-03-3.3866-03 2.6719-03-2.6086-05-3.3305-03 1.6305-03
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TABLE VII Concluded

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SPAN 5  CHORD 1        STEADY=  3.8522+00
COSINE COEFFICIENTS
 2.0919+00 1.5811+00 2.9130-01 5.0501-01-3.9004-02-1.3974-01-5.7719-02-9.3646-02
-1.3519-01-9.8406-02-1.2932-02-3.3734-02-7.0961-02-3.9397-02 9.3866-02 4.2265-02
-5.6323-02-1.2288-02 5.4187-02 2.1286-02-7.2295-02-5.3138-02-8.8187-03-7.2273-03
-4.1520-02 2.5115-02 4.0744-02 5.4266-03-1.5099-02 1.1267-02
SINE COEFFICIENTS
-1.2370+00-5.8802-01-4.2915-01-6.2079-01-4.7978-01-3.6031-01-2.2704-01-2.8163-02
-8.7805-02-1.6219-01-4.8759-02 1.1078-01 5.3981-02-1.5028-01-5.9752-02-2.5220-02
-6.2986-02-1.3975-01-1.0505-01-3.4907-02-7.2623-02-8.8903-02-3.9709-02 1.9106-02
-1.8672-02-5.4239-02-1.2458-02 9.1485-03-2.6611-02-4.6692-02
SPAN 5  CHORD 2        STEADY=  1.1609+00
COSINE COEFFICIENTS
 2.2748-01 3.6384-01-3.2215-01-1.9117-01 1.6325-01 1.9713-01-3.1060-02-1.1201-02
-3.0325-03-9.4680-02 2.4410-02 4.6282-03-9.4527-02 3.8611-02 1.3153-01 8.1431-03
-6.4468-02-1.1217-02-1.3480-02-3.6093-02-1.2164-02 1.2793-02 4.2200-02 2.3797-02
-1.3501-02-9.4418-03-9.2455-03-3.9680-02-2.1732-02 2.5066-02
SINE COEFFICIENTS
-2.4403-01 7.4926-02 1.7887-01-3.8162-01-3.4688-01 7.4007-02 1.1341-01 3.6621-02
 6.6840-02-2.7779-02-8.0613-02 5.9548-02-2.2783-02-1.2342-01 6.1039-03 9.4822-02
 1.7434-02-1.4412-02 1.4598-02-1.2096-02-4.8456-02-4.0312-02-1.0275-02 2.8816-02
 2.5462-02-7.7183-04 1.5776-02-3.3395-03-4.1172-02-3.2656-02
SPAN 5  CHORD 3        STEADY=  1.8184-01
COSINE COEFFICIENTS
-3.4178-01 2.2636-01-3.2560-02-1.4013-01 9.7603-02 1.7576-01-1.1957-01-6.8889-02
-7.3469-02-1.2066-02 1.8852-01 4.9582-02-8.9640-02-7.5860-02-3.5698-02 6.7314-02
 7.3391-02-1.3246-02-5.0218-02-2.4489-02 1.2512-03 2.3562-02 4.1121-02-7.9562-03
-4.6243-02-1.2566-02 1.2377-02 3.5705-02 1.0164-02-2.4814-02
SINE COEFFICIENTS
-5.1914-01-2.0836-01 1.7745-01-1.1459-01-2.3937-01 1.5470-01 1.3532-01-7.8029-04
-1.3380-02-1.6750-01-4.9251-02 1.6154-01 7.4310-02-1.2855-02-8.5447-02-7.4803-02
 [illegible].3211-02 7.4409-02 1.7776-02-3.1357-02-3.4416-02-2.6320-02 1.6348-02 5.1677-02
 3.7095-03-3.1554-02-2.8456-02-5.1743-03 3.6051-02 2.0984-02
SPAN 5  CHORD 4        STEADY= -1.9193-01
COSINE COEFFICIENTS
-3.9314-01 7.0409-02 2.5496-03 3.6392-03-2.7981-02 1.0094-03-7.9245-03-8.4421-04
 6.0007-03 7.7451-04-2.1974-04-1.0170-03-1.0344-03 4.1036-03 9.9115-04-1.7013-04
-6.1498-04-8.2977-04-1.1422-04 3.4584-04 1.8544-03 1.4852-03-4.3563-03-6.9525-05
-1.7413-03 2.0535-03-5.2038-04-1.1668-03 8.2218-05 1.5667-03
SINE COEFFICIENTS
-2.6216-01-7.5712-02 4.1631-02 6.0684-03-8.7412-03-5.8244-03-3.0011-03 7.3681-03
 4.7052-03 3.6956-03-5.8810-03-2.7051-03 1.5559-03 2.8091-03 2.6170-03-2.5764-03
-1.4684-03-3.7160-05 1.1852-03 1.4538-03-2.0710-03 1.2430-03 6.3242-04 3.6152-04
-1.8165-04-7.3682-04 9.6047-04-1.9318-03-7.8798-04 1.3296-03
SPAN 5  CHORD 5        STEADY= -4.3901-01
COSINE COEFFICIENTS
-1.6340-01-2.7109-03-7.3843-03 4.0004-03-1.0941-02 1.5422-02-2.6676-03-4.3488-03
 3.1469-03 7.5604-03 4.7359-03 2.9112-03 1.3975-02-2.4671-02-2.8420-03-3.4610-03
-7.8810-04 3.3814-04-6.9932-03 6.8667-05 7.0719-03-8.3436-05-1.5762-03 2.3385-04
 3.0705-03-8.3413-04 2.2771-03 1.7025-03 3.0090-03 2.5441-03
SINE COEFFICIENTS
-2.4782-01-2.3698-02 2.4086-02 2.7757-02-7.9328-03-9.5922-03 5.2043-03 5.1507-03
 4.1839-03 5.6710-04-3.1119-03-1.6578-02-9.7995-03 4.0075-02 1.2444-02 1.9845-04
 3.3750-03 6.7822-03 2.3900-03-2.0297-03 7.9301-04 3.3486-03 4.8541-04 1.2148-03
 1.1255-03 1.3947-03-2.4436-04 3.8726-03 8.2530-04 4.5212-03
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TABLE VIII. AERODYNAMIC DATA - 140-KNOT, WEST-TO-EAST FLIGHT

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BURST NO. = 23           *** ROTOR NOISE PUNCHED OUTPUT ***
BLADE PITCH HARMONICS
 1.2486801 3.1825800-5.4590800  %COLLECTIVE, LONGITUDINAL, LATERAL RESPECTIVELY%
ROTOR FLAPPING ANGLE HARMONICS
 1.6400800 2.4828-01 0.0000      %POSITIVE TAIL HIGH -- DEGREES%
DIFFERENTIAL PRESSURE HARMONICS FOR 5 CHORD STATIONS AT EACH OF THE 5 SPANS
%MEASURING FROM THE LEADING EDGE AND THE BLADE ROOT RESPECTIVELY%.
SPAN 1  CHORD 1        STEADY= 1.4340800
COSINE COEFFICIENTS
-8.7874-01 7.1484-01-3.0694-01-4.4989-02-1.3330-01 6.3239-02-8.6684-02 1.8630-02
-5.3068-02 2.3941-02-4.3362-02-5.3878-03-3.3959-02-4.5089-04-2.4391-02-4.5592-03
-2.5277-02 1.0213-03-9.7478-03 1.1614-02-5.1615-03 1.3763-02 1.0093-02-8.0250-03
-2.1242-04 1.0761-03-9.4748-03-3.7920-03-4.2746-03-9.7890-03
SINE COEFFICIENTS
 6.5338-01 6.2492-02 3.9053-01 1.1666-01-3.2466-02 6.2006-02 7.5729-03 3.6348-02
 9.5052-03 2.4870-02 3.8347-03 7.2457-03 4.0980-03-5.3440-03-9.9445-04-2.2815-02
-1.4517-02-2.5601-02-3.7192-03-2.4937-02-9.1851-03-1.4864-02 5.9914-03-1.5957-02
-3.6172-03-1.1585-02 7.7 [illegible]-03-9.5806-04-8.9636-03-1.3605-02
SPAN 1  CHORD 2        STEADY= 5.4473-01
COSINE COEFFICIENTS
-3.0225-01 2.1700-01-1.1553-01-2.6728-02-5.5898-02 4.2305-03-4.6233-02-2.0659-03
-2.0846-02 2.3386-03 1.7843-03-1.6328-02-8.5534-03 3.3427-02 1.6826-02-3.6135-02
-1.4708-02 3.4336-02 2.4594-03 1.7907-02 8.7563-03 9.9761-03 1.8707-02-5.8819-03
 1.9566-02-8.9813-03 1.1289-02-1.8383-02-6.7143-03-2.2319-02
SINE COEFFICIENTS
 3.5827-01 1.0530-02 1.5153-01 4.3532-02 1.7294-02 4.4564-02 2.6098-02 1.7979-02
 1.3407-02 7.3889-03 1.7632-02 1.2439-02-5.3148-03 3.3715-04-1.8562-02-1.3984-02
 4.7696-03 3.7285-03 2.0920-02-4.1993-03-1.3032-02-5.1518-03 7.4878-03-1.4612-02
 1.2383-02-1.9490-02 1.3237-02-1.3391-02-8.1526-03-8.5740-03
SPAN 1  CHORD 3        STEADY= 1.7820-01
COSINE COEFFICIENTS
-1.9004-01 1.7851-01-6.6939-02-1.7299-02-3.0073-02 1.7263-02-1.5017-02 5.4770-03
-8.9028-03 1.1538-03-4.8926-03-5.6285-03-3.9304-03-1.8216-03-3.7051-03-5.1657-03
-9.2318-04-2.8435-03-1.4183-05 2.5970-03 4.3818-06 2.6348-03-6.7997-04 1.4290-03
 2.5287-03 3.1129-04 1.4623-04-3.9497-03-1.2532-03 1.0408-03
SINE COEFFICIENTS
 1.8595-01-1.6215-02 8.4336-02 3.0863-02-1.1531-02 1.6131-02 7.2811-03 6.9570-03
-1.6345-03 4.6558-03 2.4842-03 1.5022-03 2.0586-03-1.8465-03-1.6681-03-1.3205-03
-8.3347-04-4.3646-03-2.7298-04-2.5428-03-9.0858-04-3.0436-03-3.4701-03-3.8967-03
-3.3171-03 1.5185-05 7.7675-04 2.2507-03-1.5983-03 5.4818-04
SPAN 1  CHORD 4        STEADY= 0.0000
COSINE COEFFICIENTS
 0.0000    0.0000    0.0000    0.0000    0.0000    0.0000    0.0000    0.0000
 0.0000    0.0000    0.0000    0.0000    0.0000    0.0000    0.0000    0.0000
 0.0000    0.0000    0.0000    0.0000    0.0000    0.0000    0.0000    0.0000
 0.0000    0.0000    0.0000    0.0000    0.0000    0.0000
SINE COEFFICIENTS
 0.0000    0.0000    0.0000    0.0000    0.0000    0.0000    0.0000    0.0000
 0.0000    0.0000    0.0000    0.0000    0.0000    0.0000    0.0000    0.0000
 0.0000    0.0000    0.0000    0.0000    0.0000    0.0000    0.0000    0.0000
 0.0000    0.0000    0.0000    0.0000    0.0000    0.0000
SPAN 1  CHORD 5        STEADY= 2.0679-01
COSINE COEFFICIENTS
 8.4039-03-3.4984-02 2.5648-03-1.2759-03 1.9745-03-1.7336-03 4.0416-05-8.6213-04
 6.1971-04 9.6005-06 7.7133-04 6.7053-04 1.7619-04 8.4334-04-1.0271-04 8.6809-04
-1.8759-04-1.7472-04-5.3840-04-1.1281-05-9.3874-04-2.3010-04 9.2592-04 9.0275-05
 8.9976-04 9.6660-04 1.5811-03 9.7413-04 7.1062-04-7.9322-04
SINE COEFFICIENTS
 3.0284-02 7.3932-03 1.2719-03-3.2689-03-4.1976-04-1.4820-03-1.4269-04-1.1829-03
 1.1139-04-8.7763-04 3.5134-04 1.3716-04 1.0734-03 1.6350-04 4.8294-04-1.3108-03
-2.2989-04-5.8366-04-7.7723-04 1.2986-03 1.2950-03 1.0849-03 1.3752-03 7.8203-04
 1.6209-03 5.5983-04-2.7793-04 1.7452-04 1.6796-04-8.2365-04
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TABLE VIII - Continued

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SPAN 2  CHORD 1          STEADY#  4.1495+00
COSINE COEFFICIENTS
 2.0497-01 1.5885+00-1.9094-01 2.4764-01-2.5134-01 1.9323-01 2.8384-02-9.7484-02
 5.7413-02-7.1897-02 7.8027-02-7.9187-02 2.2220-02 1.0234-02-3.2931-02 3.7803-02
-5.5312-02 6.5381-02-3.5078-02 1.6665-02 1.4064-02-1.3261-02 2.4319-02-3.8681-02
 4.3270-02-7.0932-03 3.2565-03 6.3751-03-6.9985-03 3.3273-02
SINE COEFFICIENTS
 4.5836-01 5.6924-01 3.6997-01-4.0758-01 4.0585-02-1.0826-01 1.4385-01-8.0024-02
 1.1718-01 2.9027-02-2.8150-02 7.1455-02-2.9803-02 8.8705-02-4.6938-02 5.5389-02
 1.6075-02-2.4777-02 4.0714-02-2.6319-02 4.8098-02-3.2531-02 2.8999-02 4.0067-03
-1.6223-02 2.5976-02-1.2364-02 1.2877-02-1.8484-02 1.4018-02
SPAN 2  CHORD 2          STEADY#  1.6678+00
COSINE COEFFICIENTS
 1.0782-01 6.6408-01-3.6098-02 7.2265-02-9.0166-02 8.0200-02 2.0279-02-4.6111-02
 2.3246-02-9.6724-03 1.0238-02-1.4213-02-6.0417-03 1.4123-02-1.4746-02 1.2418-02
-2.1891-03 5.0931-03-2.0293-03-3.3419-03 1.1225-02-5.3649-03 5.6827-03-3.4853-03
 4.3398-03 2.2936-03-1.4198-03 7.0706-03-8.1818-04 3.8964-04
SINE COEFFICIENTS
-4.8381-02 2.0987-01 1.5258-01-1.7657-01 1.5114-03-2.5867-02 4.9398-02-1.6982-02
 3.1736-02 2.1651-02-1.3732-02 2.6868-02 2.3043-03 1.9549-02-1.4593-03 7.8296-03
 1.7407-02-5.6798-03 1.9369-02-4.9624-03 2.3779-03 4.4731-04-6.0600-03 8.2434-03
-6.5607-03 4.9062-04 3.0995-04 2.5734-03 3.2855-04 3.2147-03
SPAN 2  CHORD 3          STEADY#  1.4145+00
COSINE COEFFICIENTS
 1.0701-01 3.4474-01-5.9335-03 2.0535-02-5.4806-02 4.8337-02 1.2665-02-1.7619-02
-2.7277-03-2.2539-04 5.7945-03-9.1742-03 1.0403-03 5.5817-03-4.3757-03 8.3118-04
 2.5289-03-1.0211-05-6.9980-03 1.1900-03 7.9408-03 1.9521-03-2.8921-03 1.8554-03
-1.3962-03-1.9682-03-2.6614-03 3.7291-03 2.6643-03-7.0814-04
SINE COEFFICIENTS
 1.5106-01 9.8864-02 1.0496-01-8.3167-02-1.7693-03-7.7889-03 1.3390-02 3.3000-04
 2.0397-02 6.0711-03-1.2474-03 1.2708-02 4.5386-03 2.3149-03 2.9261-04 6.4200-03
 7.8222-03-3.0478-03 4.4285-03-5.8666-04 1.8263-03 5.2003-03-4.3565-04 2.9310-03
-4.5253-04-2.1487-03-7.5452-04-2.5031-03-9.9566-04 5.1405-03
SPAN 2  CHORD 4          STEADY#  2.3909-01
COSINE COEFFICIENTS
-1.6427-01 2.5080-01 2.8126-02 1.1419-02-2.4656-02 2.1281-02 1.0006-02 7.5032-04
-6.8432-03 1.9082-03 1.2563-03-1.8465-03-2.4350-03 2.4663-03-8.8062-04-4.7107-03
 2.6440-03 1.3220-03-1.8428-04-3.1407-03 1.6714-04 2.7063-03-5.5203-04 5.6405-04
 7.9377-04 1.8619-03-5.2085-04-6.0527-04 9.9270-04 4.7207-05
SINE COEFFICIENTS
-1.6144-01-7.3921-03 2.1577-02-4.2443-02 8.1691-03-2.8208-03-2.7250-03 2.8406-03
 7.1094-03 1.9637-04-1.3631-03 4.3469-03 7.6220-03-2.6334-04 2.5707-03 1.5491-04
 2.9742-03 2.2065-03 1.2993-03 8.5527-04-7.4683-04 8.6451-05-2.1226-03 3.0938-03
 2.1048-03-6.0585-04 9.7673-04 1.1129-03 1.9126-03-8.7971-04
SPAN 2  CHORD 5          STEADY# -2.4270-01
COSINE COEFFICIENTS
-3.1236-02 7.4330-02 1.0086-02 8.5297-04-1.8428-03 3.7905-03 1.4632-03 2.0652-03
-2.6638-03 2.8309-03 1.5485-04-2.0732-03 7.1869-04 8.0536-04 2.2192-03-4.2879-03
 2.3174-04 6.2183-04 1.9550-03-9.9506-04-1.7854-03 3.6697-03-5.7817-04 6.6335-04
-9.4700-04-9.9614-04 2.2213-03-2.3120-03 1.4421-03 1.0282-04
SINE COEFFICIENTS
-2.2332-01-2.3622-03-3.5269-03-4.3183-03 4.0028-03-1.8676-04-4.5723-03 9.9386-04
 2.4172-03-1.2651-03 9.2622-04 4.2671-04 2.7231-03-1.5372-03 2.3551-03 1.5839-03
-1.3254-03 4.8007-04-3.3068-03 3.4790-03-6.0879-04 3.3349-04 1.4111-03 5.3615-04
 2.6113-03-4.2404-04 3.5933-04-5.2649-04 6.9604-04 1.2827-03
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TABLE VIII - Continued

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SPAN 3  CHORD 1        STEADY=  4.6217+00
COSINE COEFFICIENTS
 1.8001+00 1.8397+00 5.2699-02 1.8407-01-9.8675-02-5.5541-02-4.9690-02 1.0797-01
-8.8533-02-7.2509-02 5.5413-02-2.4398-02-1.8795-02 3.0521-02-4.7627-02 5.4482-03
 4.8926-02-4.3333-02-1.3243-02 3.3535-02-2.7286-02 9.8975-03 1.4385-02-2.6289-02
 1.6515-02 1.8545-02-2.3604-02 2.3913-02 1.2209-02-1.9702-02
SINE COEFFICIENTS
-2.3579-01 6.2355-01 5.7155-01-4.6036-01-1.6935-01 1.6415-01-1.2249-02 2.1414-02
 4.6968-02-3.2980-02 7.7086-02 4.9025-02-5.8260-02 4.4282-02 4.6335-02-5.0285-02
 1.5685-02 1.2420-02-3.0809-02 3.5421-02 3.4757-03-3.3679-02 4.3713-02 8.3506-03
-1.7953-02 3.9379-02-6.2427-03-1.7336-02 2.1563-02-1.1342-04
SPAN 3  CHORD 2        STEADY=  1.0838-01
COSINE COEFFICIENTS
 8.0775-01 8.1767-01 1.2930-02-6.9963-02-1.4689-02-7.5263-03-1.6898-02 5.4032-02
-4.0292-02-2.7696-02 3.3123-02-1.9776-02-4.4662-03 6.9802-03-1.3682-02 6.7630-03
-4.0312-03-9.1519-03-3.0938-03 1.3010-02-1.7911-03-1.1561-02 1.8676-02 1.5455-03
-5.8165-03-6.2246-03-1.1717-03 1.3649-02 1.0530-03-1.3642-03
SINE COEFFICIENTS
-1.2593+00 2.0895-01 2.7736-01-1.9121-01-1.1814-01 5.4737-02-1.8944-02 2.4026-03
 2.4537-02-1.4725-02 3.2957-02 1.7144-02-3.2413-02 2.1415-02 1.2597-02 2.2783-03
 1.4904-03 2.1233-03 8.1790-03-8.3939-03 1.1858-02-9.6313-03-1.0806-04 2.0674-02
-7.0857-03 5.4526-03-1.3370-02 6.3376-03 1.2524-02-6.5888-04
SPAN 3  CHORD 3        STEADY=  1.2898+00
COSINE COEFFICIENTS
 1.9775-01 4.0129-01 4.1139-03 2.4884-02-3.0772-02-2.9508-02 9.1375-03 3.6126-02
-3.0390-02-3.1084-02 4.8011-03 1.3235-02-1.6099-03-1.1310-02 5.2304-03 5.5201-03
-2.8674-03-9.7252-04-7.3075-03 2.6024-03 2.8005-03-7.6002-03 2.6116-03 2.4510-03
 6.7486-03-4.0983-03 5.2097-04 3.9748-03 4.0192-03-8.2935-04
SINE COEFFICIENTS
-4.4021-01 3.5334-02 8.2507-02-1.2981-01-1.8605-02 1.7512-02-2.3333-02 7.1384-03
 1.8282-02-2.4941-03-2.3395-03 1.5127-04 6.1738-03-1.9674-03 2.6927-03-1.2106-03
-4.9300-03 3.8883-03 1.8530-03-3.5367-04-1.4084-03 2.6512-03 1.2755-03 2.9251-04
-1.0932-03 4.3912-03-3.4162-04 1.3638-03-7.1986-04 4.9188-03
SPAN 3  CHORD 4        STEADY= -5.9369-01
COSINE COEFFICIENTS
-3.1939-03 1.9091-01 2.6635-02 3.1220-03-2.5171-02 4.3134-03 1.0260-02 5.4775-03
-8.2419-03-4.1849-03 8.3741-04 3.6287-03 1.7223-03-9.1471-04 5.4767-04-7.1306-05
-1.9886-03 5.3397-04 1.8502-03-1.2542-04 1.2022-03-1.3874-03-2.6618-04 6.0613-04
 1.7432-03 1.6529-04-3.2711-05 3.7247-05-3.8346-04 1.7507-03
SINE COEFFICIENTS
-2.7166-01-2.0818-02 4.0086-02-4.0317-02-1.1121-02-4.0238-03 1.8875-03 4.6834-03
-2.5574-03 2.5160-03 5.1430-03-3.6835-04 1.9382-04 2.0094-03 3.5421-03 2.6969-03
-2.6285-03-2.2118-04 3.3515-03 1.1239-03-1.3359-03-5.3946-05 1.2818-04 1.6797-03
-1.1155-03 1.1472-03 5.7940-04 2.4210-03-2.7984-04 1.0178-04
SPAN 3  CHORD 5        STEADY= -2.2170-01
COSINE COEFFICIENTS
-8.8295-03 5.0322-02 9.2771-03-1.3756-04-4.4485-03 1.9364-03 2.4801-03-3.1585-04
-9.0095-04 1.1061-03 2.5304-04 2.4574-03 2.2322-03-8.3511-04 2.5039-03 5.8304-04
-2.4278-03 4.8725-04 2.2250-03-1.0059-03 1.5810-03-1.8073-03-1.7088-03 1.3428-03
 7.4764-04-1.1875-03 1.1193-03-4.6276-04-7.7219-04 1.8466-03
SINE COEFFICIENTS
-1.5570-01-1.1072-02-5.9127-03-9.8178-03 2.5236-03-2.8820-03-6.2447-04-2.2192-03
-3.3562-03 1.5544-03 1.2720-03-2.3183-03 4.1513-04-5.2387-04-2.0933-05 3.2302-03
-1.1894-03-1.0041-03 1.0442-03 1.5776-03-5.5618-04 1.2988-03 2.0637-04 1.0734-03
 5.2330-04-1.3243-03-1.2978-03 1.0245-03-1.5675-03 1.4037-05
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TABLE VIII - Continued

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SPAN 4  CHORD 1        STEADY#  3.7895+00
COSINE COEFFICIENTS
 2.0476+00 1.5019+00 1.8422-01 3.2336-01-1.9702-01-7.0542-02-2.1020-02-4.0690-02
-1.0936-02 1.7241-02-2.1046-02-5.4869-02 7.9125-03 6.4300-02 6.8571-03-4.3788-02
 1.6008-02 3.7613-02 4.6565-03-1.9309-02 1.0507-02 1.6009-02-1.1713-02-4.0824-03
 3.2483-02 6.9130-03-2.1894-02 9.9147-03 2.5404-02-4.8435-03
SINE COEFFICIENTS
-1.6729+00-1.1049-01 6.3047-03-3.0514-01-2.1896-01-5.8885-02 6.3013-02 1.0773-01
-6.6723-02-4.4623-02 6.8065-02 5.5311-02-1.0264-02 2.4991-03 1.7918-02-1.3609-03
-7.7359-03 1.5439-02 2.0411-02-2.8174-02-1.4582-02 3.0603-02 9.0972-03-1.4258-02
-5.2369-03 2.7654-02 7.6240-03-2.8823-02 5.2808-03 2.7055-02
SPAN 4  CHORD 2        STEADY#  9.8028-01
COSINE COEFFICIENTS
 1.3530+00 7.8215-01-1.8164-01 6.5023-02-1.0137-01-7.1291-02 6.0045-02-1.3510-02
 7.1105-03 4.7708-02-3.4233-02-4.7332-02 6.4499-03 5.9972-02 4.1789-04-5.5356-02
 2.1016-02 1.4951-02-1.4779-02 1.0436-02-9.5479-03-2.4606-04-4.3784-03-2.4836-03
 8.9736-03 1.6963-03 1.1215-02-6.8452-03-3.8983-03 9.3964-04
SINE COEFFICIENTS
-1.1260+00 3.1550-01 2.2570-01-2.2306-01-5.4271-02-9.7410-02-2.7053-03 8.7143-02
-5.6545-02 3.8218-03 5.8280-02 4.2883-03-3.1031-02-1.6243-02 3.7705-02-4.8232-03
-1.8516-02 2.6881-02-2.1177-03-9.4070-03-7.1900-04-1.6168-03 4.6313-03-1.0813-02
-1.6807-03 1.8980-04 9.7946-03 2.1420-02-8.8502-03 1.4851-03
SPAN 4  CHORD 3        STEADY#  8.4055-01
COSINE COEFFICIENTS
 5.5892-01 7.6080-02-5.9357-02 2.2438-01-2.3654-02-1.8103-02 2.0309-02-5.6504-02
-2.3723-02-1.9427-02 1.9630-02 9.8881-02-1.1632-03-5.1765-02-2.5610-02-4.5115-02
 2.9846-02 6.0755-02-5.7273-03 5.0553-03-4.1427-02-4.3826-02 4.0077-02 3.7977-02
 3.5962-03 1.2038-03-2.9210-02-6.2328-03 1.4205-02 1.2725-02
SINE COEFFICIENTS
-3.2608-01 3.1929-02-1.8825-01-1.4604-01 4.4392-02-9.5601-03 7.5014-02 6.4851-02
-5.0713-02-3.8565-02-6.1764-02 3.4147-02 1.0315-01 4.1141-03-1.2149-02-3.4224-02
-5.7165-02 2.3195-02 2.5554-02 2.6508-02 3.5528-02-4.9408-02-5.0322-02 1.5481-02
 2.2328-02 2.7914-02 5.5079-03-2.7301-02-1.1328-02-1.0362-02
SPAN 4  CHORD 4        STEADY# -1.5639-01
COSINE COEFFICIENTS
 8.4512-02 1.9730-01 3.7625-02-9.5393-03-3.0487-02 9.4723-04 6.2888-03 3.4871-03
 7.7535-03-4.6734-03-3.1819-03-3.3633-03 9.1013-03 5.4803-03-4.4425-03-2.9507-03
-7.8875-04-3.0539-03 3.4600-03 4.4365-03-3.1403-03-6.4036-04 7.1387-04 1.3199-03
-4.5696-03-1.3391-03 6.2033-03 4.7193-03-3.0054-03 6.1366-04
SINE COEFFICIENTS
-5.1966-01-4.5289-02 5.2622-02 3.0745-03-2.5181-02-9.8398-03 4.5428-03 8.4908-03
 2.2244-04 4.2285-04-1.7814-03 3.2938-03 1.7931-03-1.7009-03 1.2030-03-1.8337-03
 2.7959-03-3.0183-04-2.5036-03-5.1321-03 7.2513-03 2.2410-03 1.3647-03 2.0782-04
 1.2286-03-4.9634-03-1.1706-03 2.6976-03-1.1681-03-1.3475-03
SPAN 4  CHORD 5        STEADY# -5.5243-01
COSINE COEFFICIENTS
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 1.0747-03-3.6383-03-1.8011-04-4.3083-04 3.1180-03 2.3086-03 4.3511-04-3.5361-04
-8.4913-04-1.4498-03 5.6174-04-3.3064-03-7.1377-03-4.6901-03 3.9933-03 3.0580-03
-5.9295-03-1.6693-03-1.1440-03-4.3379-03 3.5448-03 9.4749-03
SINE COEFFICIENTS
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 1.9244-03-7.9017-04-3.5772-03 6.9699-04 1.0306-03-7.2752-03 2.5070-03 1.7779-04
-2.1302-03-6.6663-04-2.1447-03 1.7038-03-6.0347-03-2.4092-03 7.2012-03-9.1320-04
-5.0709-03-8.2222-04 2.9074-03 2.2186-03 7.8190-03 6.4690-03
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TABLE VIII - Concluded


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SPAN 5  CHORD 1          STEADY#  3.6497&00
COSINE COEFFICIENTS
 2.0277&00 1.3024&00 2.2681-01 4.1923-01-1.4887-02-6.7468-02 5.5693-02 5.7308-02
-5.0617-02-2.8293-02 2.7640-02-3.6355-02-8.7881-02-4.1474-02 2.9569-02 7.2543-03
-6.3235-02-3.5220-02 6.5149-02 7.4098-02 2.5441-02-5.2351-03 4.4104-02 7.2651-02
-2.0348-03 1.2303-02 3.5950-02 2.6939-02-5.1836-03-1.6202-02
SINE COEFFICIENTS
-1.1566&00-1.7720-01-1.1327-01-3.4715-01-2.1762-01-1.5729-01-9.1517-02 6.3307-02
-4.7277-02-1.6186-01-6.2769-02 6.1147-02 6.5199-02-1.6143-01-7.3657-02 3.1757-02
 6.2352-02-2.6921-03-6.8240-03 4.6261-02 3.7016-02-1.1441-02-2.9357-02 3.6235-02
 1.0029-02-3.5744-02-2.1460-02 2.1073-02 3.0960-02-5.1967-02
SPAN 5  CHORD 2          STEADY#  9.8433-01
COSINE COEFFICIENTS
 2.3623-01 2.9755-01-1.6073-01-1.5638-01 6.7003-02 2.5128-01 2.4780-02-1.2809-01
-6.3838-02-1.7025-02 1.7007-02 1.4478-02-3.7850-02 5.1694-02 1.1389-01-1.9770-02
-1.1524-01-3.7847-02 3.0055-02 2.2345-02 2.0762-02 2.2722-02 1.4114-02-9.4769-03
-3.1279-02-2.7929-02-5.3298-05 1.9649-02 2.9966-02 2.1511-02
SINE COEFFICIENTS
-2.9570-01 5.8596-02 1.5026-01-2.2683-01-3.1934-01 2.4044-02 2.2752-01 9.9327-02
-4.5270-02-5.9971-02-4.1055-02 2.6997-02-7.9782-03-7.3933-02 3.0619-02 1.2282-01
 2.0746-02-6.8339-02-3.6912-02-1.7099-02-1.0608-02 8.0144-03 2.6565-02 3.1734-02
 8.9777-03-2.1968-02-3.1911-02-1.5742-02 2.7311-03 2.0797-02
SPAN 5  CHORD 3          STEADY#  1.9086-01
COSINE COEFFICIENTS
-2.2339-01-9.3401-02-3.9034-02 1.3886-01 2.2747-02 9.8829-02-9.0263-02-1.9725-01
 4.8642-02 1.7705-01 3.2405-02-7.5076-02-9.0414-02-1.8722-02 9.4839-02 7.3484-02
-5.7869-02-7.2646-02 9.4855-03 4.1854-02 3.3613-02-1.1978-02-3.5572-02-3.3151-03
 2.5644-02 5.8841-03-3.1287-03-5.8630-03-6.5022-03 1.8002-03
SINE COEFFICIENTS
-2.8288-01-6.1251-02-1.2936-01-7.7748-02-2.7768-02 7.6246-02 1.7263-01-4.5564-02
-2.0363-01-4.2131-03 1.2435-01 7.5154-02-9.4281-03-1.0182-01-6.2724-02 7.5078-02
 8.0258-02-2.7045-02-5.9453-02-1.6459-02 2.1843-02 3.5444-02 2.2052-04-3.0432-02
-8.1517-03 1.3568-02 5.5960-03 3.7145-03 9.3813-04-8.2746-03
SPAN 5  CHORD 4          STEADY# -3.4329-01
COSINE COEFFICIENTS
-3.6187-01 2.1146-02 1.2440-02 2.6984-02-2.1395-02-1.2230-02-7.1884-03 1.9346-02
 4.4623-03-1.4888-02-2.6982-03 1.3933-02-1.6462-04-1.1569-02-2.6798-04 1.4995-02
-4.6342-04-1.8820-02-5.6408-04 1.7653-02 8.8426-04-1.8906-02-2.5260-03 1.9900-02
 1.7415-04-2.0125-02-7.1857-04 1.9877-02 4.9344-05-2.3700-02
SINE COEFFICIENTS
-2.0043-01-4.7243-02 8.2882-03 1.9584-03 1.3432-02-4.7506-03-2.0488-02 1.0935-02
 2.0655-02 2.7275-03-2.0034-02-2.5219-03 1.8332-02 2.3406-03-1.4805-02-3.2807-03
 1.7108-02 4.8605-04-1.6557-02-2.9254-04 1.7365-02-1.1549-03-1.9522-02 1.4461-03
 2.0356-02 9.9128-04-2.1400-02 2.2587-04 2.1969-02-6.0792-04
SPAN 5  CHORD 5          STEADY# -5.7754-01
COSINE COEFFICIENTS
-1.6072-01-1.1016-02 2.1280-03 4.3326-03-1.5985-03 5.4335-03-2.7068-03 1.0081-03
 7.5208-03 1.0360-02-1.3959-03 4.5645-03 1.9450-02-3.9934-02-2.2850-03-7.5476-03
 3.4811-03-6.3923-03-3.6775-03-1.5817-03-2.1451-05 2.3775-03-5.4076-03-3.3899-03
 5.9754-03-1.7975-03-1.7873-03-6.5757-03 2.2701-03-1.7764-03
SINE COEFFICIENTS
-2.1563-01-1.5051-02 1.9678-02 1.5776-02-7.4650-03-4.7539-03 2.6133-03 2.5928-03
-2.6560-03-2.1273-03-2.8327-03-1.0653-02-6.9958-04 2.0171-02 7.9891-03 1.0255-03
-9.5783-04 1.1313-02 5.2463-04 4.0573-05-1.7358-03-7.2395-04 5.7763-03-1.4173-03
 1.3313-03 4.3858-03-2.4426-04 2.9009-03 3.5849-04 9.3970-03
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TABLE IX. AERODYNAMIC DATA - 170-KNOT, EAST-TO-WEST FLIGHT

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BURST NO. # 29             *** ROTOR NOISE PUNCHED OUTPUT ***
BLADE PITCH HARMONICS
 1.5546801 4.9134800-8.4462800  %COLLECTIVE, LONGITUDINAL, LATERAL RESPECTIVEL
ROTOR FLAPPING ANGLE HARMONICS
 1.9927800 3.9739-01 0.0000      %POSITIVE TAIL HIGH -- DEGREES%
DIFFERENTIAL PRESSURE HARMONICS FOR 5 CHORD STATIONS AT EACH OF THE 5 SPANS
%MEASURING FROM THE LEADING EDGE AND THE BLADE ROOT RESPECTIVELY%.
SPAN 1  CHORD 1         STEADY#  1.1983800
COSINE COEFFICIENTS
-1.0415800 1.2808800-7.7225-01-2.5942-01-1.4078-01 1.5607-01-9.2889-02 3.4479-04
 1.6256-02 1.0277-02 2.9061-03-3.9422-03-4.2291-03-1.3762-02-4.1117-03 8.5788-04
-5.0536-03 5.0310-03 1.4332-02 1.8746-03 1.6661-03 6.0260-03 4.8956-03-6.3040-03
-5.2236-03 4.9684-03-2.6315-03-2.3534-03 6.9054-03 1.3314-03
SINE COEFFICIENTS
 2.6313-01 2.7256-01 7.4164-01-8.7592-02-2.0768-01 1.3183-02 2.5878-02-5.5683-02
-2.6174-02-1.4816-02-2.9247-02-2.1113-03-7.7634-03 8.4036-03-2.4053-03 4.1907-03
 4.7974-04 6.0961-03 2.7657-03-7.6328-03-6.8676-03-1.1038-02-5.4443-03-5.6225-03
-4.1854-03-4.6181-03 3.3433-03 6.9911-03 3.9864-03-5.1586-04
SPAN 1  CHORD 2         STEADY#  4.6796-01
COSINE COEFFICIENTS
-3.4656-01 4.3822-01-2.5723-01-9.0981-02-3.8631-02 8.2267-02-1.5171-02 1.2184-02
 1.9120-02 5.1382-03 6.5025-03-8.2903-03-9.6184-03 5.0489-03-3.1380-03-3.4102-02
-1.7709-02 5.0765-03-5.3043-03 2.0901-02-1.1406-02-2.4565-03-1.4235-02-8.8784-03
-7.5605-03-1.1770-03 3.7395-03-1.6006-02 2.4025-03-3.4868-03
SINE COEFFICIENTS
 2.0562-01 3.2633-02 2.5790-01-7.0077-02-8.5451-02 3.1197-03 2.8500-02-2.0355-02
-1.4504-02-3.7135-03-1.8101-02-8.5968-03 5.9224-03-1.0937-02-3.9987-02 3.0814-03
 9.9306-03 4.9847-03-1.9643-03-6.8712-04-3.3972-03-4.8080-05-3.4930-03-1.2801-03
-6.6481-03 1.2615-03 3.0860-02-1.5372-02 3.7652-03 1.7988-03
SPAN 1  CHORD 3         STEADY#  1.8890-01
COSINE COEFFICIENTS
-2.1163-01 3.2840-01-1.6134-01-7.4263-02-3.7848-02 4.3147-02-9.6868-03 9.2986-03
 6.5271-03 4.3619-03-1.8861-03-5.7542-03-6.2236-03-7.6062-03-3.0733-03-4.7009-04
-1.3567-03 1.5421-03 5.3955-03 1.5111-03 3.1283-03 1.2200-03 2.7522-03 3.1988-03
-1.0480-03-1.4849-03 9.4185-04-2.2565-03-3.8551-03-3.4842-03
SINE COEFFICIENTS
 8.9873-02 1.0249-02 1.6048-01-4.9467-03-3.7758-02 2.0715-03 1.0686-02-1.0537-02
-1.7477-02-1.0229-02-1.2466-02-7.8926-03-6.2611-03 1.4166-03 9.2012-04 9.5054-03
 5.1543-03 4.7969-03 1.7600-03 2.9961-04-2.6060-03-2.1518-03-6.1817-04 2.9234-03
-5.4433-03-1.1648-03-5.8600-03-1.6078-03 2.5289-03 9.1946-04
SPAN 1  CHORD 4         STEADY#  0.0000
COSINE COEFFICIENTS
 0.0000    0.0000    0.0000    0.0000    0.0000    0.0000    0.0000    0.0000
 0.0000    0.0000    0.0000    0.0000    0.0000    0.0000    0.0000    0.0000
 0.0000    0.0000    0.0000    0.0000    0.0000    0.0000    0.0000    0.0000
 0.0000    0.0000    0.0000    0.0000    0.0000    0.0000
SINE COEFFICIENTS
 0.0000    0.0000    0.0000    0.0000    0.0000    0.0000    0.0000    0.0000
 0.0000    0.0000    0.0000    0.0000    0.0000    0.0000    0.0000    0.0000
 0.0000    0.0000    0.0000    0.0000    0.0000    0.0000    0.0000    0.0000
 0.0000    0.0000    0.0000    0.0000    0.0000    0.0000
SPAN 1  CHORD 5         STEADY#  2.4822-01
COSINE COEFFICIENTS
 1.5614-02-7.9506-02-9.8549-03 1.8233-02 1.3463-02-9.2831-03-6.2258-03-1.7259-03
-1.9158-04-1.6235-03-3.0597-04 8.2641-08 6.1880-04 3.6085-04-8.3794-04 5.6118-05
 3.4340-04-8.1961-04-2.3392-03 2.4796-04 5.5208-04 2.2820-04 1.4864-03 2.7087-04
 7.7029-04 6.3238-04-5.7180-05-6.2263-04-1.6305-03-8.7847-04
SINE COEFFICIENTS
 3.0899-02-3.8654-03 1.9442-02 7.4190-03-8.0427-03-7.1367-03 3.7625-05-6.2299-04
-6.7709-04-1.4674-03 4.7060-04-5.5450-04 1.0394-03-1.0342-03-2.8766-04 3.3704-04
 1.6435-04-1.0668-03-1.3921-03-3.3349-04 1.2718-03 1.6211-03 3.0092-04-6.2560-04
-9.9254-04 1.3053-04 1.0119-03-4.7312-04-1.2227-03-4.8460-05
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TABLE IX - Continued

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SPAN 2  CHORD 1        STEADY=  4.7725+00
COSINE COEFFICIENTS
 3.5886-01 2.9252+00-1.0779+00 3.0307-01-2.3727-01 9.2486-02-1.2349-01-1.2012-01
-7.3617-04-8.4920-04-7.7934-02 4.0506-02-5.9496-02 2.9282-02-8.6680-03 1.1381-02
 2.2748-03 1.3671-02 1.9562-03 3.2678-02-3.3773-02 4.1828-02-3.5414-02 3.2025-02
-2.8650-02 1.2830-02-1.7567-02 9.1328-03-1.2558-02 1.2953-02
SINE COEFFICIENTS
 4.9567-01 1.2248+00 1.3854+00-6.9349-01 1.2426-01-7.9076-02 2.3082-01-1.0683-01
-2.8400-02-7.7081-03 1.6900-03-4.9056-02 3.5206-02-8.5150-02 3.8878-02-4.9115-02
 6.3483-03-2.5685-02-8.9622-04-1.2825-03-2.4891-03-5.7976-03 1.0123-02-1.1098-02
 2.4122-02-8.1665-03 1.8098-02-3.3055-04-5.4594-03 8.7333-03
SPAN 2  CHORD 2        STEADY=  1.8233+00
COSINE COEFFICIENTS
 3.1961-01 1.2757+00-4.4302-01-7.6088-02 1.3925-02 5.2431-02-1.7461-02-4.3483-02
 3.3540-02-2.6191-03-2.5856-02 9.6249-03-6.4617-03-7.7001-04 1.4277-02-6.5255-03
-2.5207-03 5.1948-04 1.4825-02-3.7499-03-4.7894-05-1.1009-03-8.3118-03-9.7630-03
 2.3863-03 7.1919-03 3.0449-03-1.0892-03-9.6495-03-4.5406-03
SINE COEFFICIENTS
-1.7829-01 5.2018-01 6.8853-01-4.1142-01-7.8270-02 4.2288-02 7.0980-02-2.1698-02
-3.6989-02 3.6121-02-9.4956-03-1.4694-02 6.0133-05-1.8418-02 7.7414-03 3.1900-03
-2.3059-03-6.5619-03-7.0880-03 2.7527-03 2.9923-03 5.3803-03 7.2488-03-3.8511-03
 1.0714-03 4.2441-03 8.5747-03 2.5766-03-1.7599-03 2.4739-04
SPAN 2  CHORD 3        STEADY=  1.5831+00
COSINE COEFFICIENTS
 1.3964-01 6.5127-01-1.8722-01-5.4681-02-2.4686-02 4.6989-02 4.5694-03-3.5030-02
 7.6772-03 7.7846-03-1.0395-03 2.5103-03-1.3304-03 9.3567-05 2.6334-03 1.6923-03
-1.8535-03-5.2507-03 5.5020-03-4.7049-06 9.9842-04-3.2128-03 1.2410-03 4.3784-04
-5.6905-03 7.5569-04 6.9370-03-2.1862-03 1.5069-04-3.8497-03
SINE COEFFICIENTS
 1.9357-01 2.1102-01 3.8881-01-1.7702-01-3.7097-02-1.0510-03 4.3610-02 9.6184-04
-3.0440-02 6.8360-03 1.9298-03-1.3726-04-9.8667-04-3.9929-03-1.9949-03 1.3234-03
 3.0610-03-3.4377-03-2.0478-03-1.8753-03-1.4940-03-4.0519-04 2.9016-03 2.1982-03
-7.7300-04-6.5659-03 1.2434-03-2.1935-03 4.0903-03 1.1065-03
SPAN 2  CHORD 4        STEADY=  2.9698-01
COSINE COEFFICIENTS
-1.6812-01 4.4107-01-2.5996-02-2.6129-02-3.1692-02 2.6235-02 1.6997-02-8.6634-03
-3.5682-04 5.7083-03 3.1925-03-6.5668-04 2.6990-03 6.5954-04-1.4317-03 8.3379-04
-1.1503-03 1.6816-03 1.6105-03-8.4667-04 2.6705-03-2.4780-03-2.4271-05 6.1104-04
 8.6131-04 2.3324-03-1.7690-03-4.1630-04-1.8893-04-6.7245-04
SINE COEFFICIENTS
-2.3039-01 2.5502-02 1.5832-01-6.4467-02 8.9594-03-1.2335-02 1.9288-02 8.9155-03
-1.0667-02-1.0577-03 3.8078-03 1.3407-03-2.4538-03 1.7861-03-7.9197-04 5.6083-04
-1.0135-03-1.6816-03 7.8811-04-1.2548-03 2.0948-03 1.4230-03-1.5010-03-7.3272-04
 1.0526-04-1.1521-04 1.0061-03-2.0286-03 6.3431-04-1.6102-03
SPAN 2  CHORD 5        STEADY= -2.6337-01
COSINE COEFFICIENTS
-9.6094-03 1.1584-01 1.1843-02-3.7187-03-9.2077-03 6.1254-03 6.6090-03 6.6840-04
-7.3581-04 4.2037-05 2.7349-03-1.3286-03 2.2495-03-1.1906-04-2.1904-03 2.3284-04
-2.0128-04 1.5013-03-1.9171-03-1.7734-04 1.7155-03-1.3118-03-1.1317-03 1.5036-03
 1.9337-03 5.0786-05-1.8781-03 4.1324-04 1.0974-03 2.0379-03
SINE COEFFICIENTS
-2.6818-01 1.4077-03 1.5463-02-3.3815-03 8.9460-03-6.5003-03 1.4724-03 2.6025-03
-5.7282-05-2.8664-03 8.7875-04-1.1582-03-1.8454-03 2.8902-03 3.2435-04-1.9370-03
-1.3834-03 5.0776-04 1.2286-03-2.0535-03 5.6025-04 1.2567-03-1.1583-03-7.6596-04
 1.1521-05 8.6136-04-2.1141-04-1.2757-03-7.1546-04-1.6743-03
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TABLE IX - Continued

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SPAN 3  CHORD 1        STEADY#  5.1823800
COSINE COEFFICIENTS
 2.2570800 3.1470800-5.1358-01 4.7075-01 1.2882-01 1.6706-01-1.0173-01 5.8350-02
 1.4786-02-3.1681-02-7.4824-03-4.5033-02-3.9007-02 2.9785-02-3.5841-02-2.0117-02
 6.5171-03 5.8995-03-3.4599-02 7.8900-03-1.2573-0 -5.0944-03-7.2155-03 1.4967-02
-4.6724-03 1.7131-02-1.2802-02-8.0220-05-3.1289-03-1.3133-03
SINE COEFFICIENTS
-5.2157-01 1.2374800 1.0522800-6.3274-01-1.7517-01 2.3778-01 5.7513-02-7.3329-03
 5.9612-02-5.2277-02-2.6550-03-1.9116-02-1.2255-03-2.7836-02 6.0808-02-2.4482-02
 3.0979-02 1.5172-02 3.6989-02-2.1385-02 2.1488-02-1.8920-02 1.0348-02-1.0370-02
-7.4861-04-9.0604-03 4.6982-03-1.2918-02-1.0903-02 1.5720-03
SPAN 3  CHORD 2        STEADY#  2.9432-01
COSINE COEFFICIENTS
 1.1562800 1.3687800-3.5691-01-7.2984-02-7.9698-02-4.1210-02 1.4928-01-1.9936-02
 3.3968-02-5.2807-02 8.6209-03-3.2444-02-7.0769-03 1.5901-02-1.0814-02 4.6495-02
-1.3014-02 2.6046-02-4.0787-02 1.0527-02-1.9177-02 3.1263-03 1.2110-03 1.5618-02
-7.6344-03 2.5235-02-5.8727-03-1.0174-02-8.0782-03-3.3886-03
SINE COEFFICIENTS
-1.3979800 5.9095-01 6.2184-01-3.5393-01-2.6881-02-1.3717-01 1.3156-02 8.8141-02
 1.5721-02 3.5897-02-3.9840-02 3.7051-02-5.8721-02 1.7827-02-4.3910-02 1.3409-02
-2.8059-04 2.2199-02 5.2531-03-1.0736-02 2.2385-03-1.0367-02-1.0495-02 5.6654-03
-1.0692-03-6.1727-03 2.6606-02-7.5391-03 1.0790-02-2.0367-02
SPAN 3  CHORD 3        STEADY#  1.5635800
COSINE COEFFICIENTS
 2.6394-01 8.1040-01-1.8544-01-2.8748-01 2.5070-01 8.3947-02-1.6072-01 5.8006-02
-1.4270-01 9.8226-02 1.3071-01-9.5408-02 2.4625-03-3.3271-02 2.3541-03 4.4794-02
 3.7848-03-1.3678-02 5.9855-03-7.1641-03-3.5504-02 3.6803-02 1.1060-03-1.6391-02
 2.6050-02-4.1956-02-2.5654-04 3.0831-02-1.0887-02 6.0531-03
SINE COEFFICIENTS
-4.1649-01 1.3298-01 5.0604-01-3.5456-01-2.3495-01 2.8707-01-2.9178-02 2.8247-02
-3.3893-03-1.8608-01 1.2862-01 5.2693-02-2.0410-02 5.3480-03-5.6513-02 4.6060-03
 2.1219-02 8.8411-03-1.4151-02 2.1004-02-2.2470-02-2.5048-02 3.9990-02-1.6786-02
 1.6027-02 1.2984-02-4.7072-02 1.1164-02 8.3027-03-4.4989-03
SPAN 3  CHORD 4        STEADY# -5.7183-01
COSINE COEFFICIENTS
 5.5642-02 3.4949-01 4.9369-03-3.9735-03-7.3704-02 2.9052-02 3.9419-02-2.0415-02
-7.4937-03 9.8424-03-1.7218-03-3.4748-04 4.9164-03-4.1153-03-7.7982-04 1.6645-03
-2.1633-03-1.2891-03 1.4029-03 5.1527-04-1.0016-03-2.1729-04-6.9404-05-1.3335-03
 1.5218-04-8.9753-04 5.3888-04 1.1859-04 5.5289-04-7.1255-05
SINE COEFFICIENTS
-3.5234-01 1.8736-02 1.1472-01-2.2027-02-2.7132-04-5.2074-02 2.1845-02 2.4717-02
-1.6450-02-3.0566-03 2.3071-03-1.5874-03 4.2682-03 2.2857-03-3.2485-03 6.0910-04
 7.0283-04-2.5972-03-1.2007-03 1.8825-03-5.6223-05-5.4322-04 1.1514-03-1.4698-03
 8.5948-04 4.0374-04-2.3657-04 3.9440-04 9.2572-04 3.3942-04
SPAN 3  CHORD 5        STEADY# -1.9950-01
COSINE COEFFICIENTS
 6.6056-03 7.7608-02 2.5922-02 1.7370-03-1.3234-02 7.0057-03 7.8664-03-9.5143-04
-2.4890-03 2.7065-03-3.0657-03 3.8332-04 2.0433-03-1.6609-03 1.6934-04 6.6970-04
-1.1377-03-5.6068-04-1.0953-03 2.4207-04-4.2831-04 1.4273-03 1.8256-03-1.5489-04
 9.0107-05-1.4097-03 1.8377-03 1.2672-03 7.8430-05-1.1206-03
SINE COEFFICIENTS
-1.8934-01-1.6027-02 5.5875-03 1.5515-03 1.2611-02-6.6645-03 3.6865-03 6.7642-03
 3.6086-04 2.2528-04-9.6297-04-2.0166-03 2.3234-03 9.5871-04-2.0024-03 6.2201-04
 4.7360-04-1.1812-03 2.4081-03 1.2569-04-1.8319-04-2.5294-04-6.0310-05-9.8397-04
 1.1753-04 1.0303-03-2.5195-04 2.1241-03-2.4639-04-1.3206-03
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TABLE IX - Continued

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SPAN 4  CHORD 1         STEADY#  4.4997800
COSINE COEFFICIENTS
 2.5692800 2.5774800-8.6861-02 4.1095-01-1.5493-01 1.5648-01-2.0620-02 1.1915-02
 8.0607-02 1.0422-01 3.8312-02 2.2419-02 1.0381-02 1.1083-02 1.1115-03-9.4664-03
-1.8215-02-3.3762-03 1.2935-03 2.6999-04 1.2487-02 1.2486-02 1.8888-03 5.4762-03
-4.9377-03-7.8480-03-1.8752-02-9.0277-03-7.4173-03 3.4371-03
SINE COEFFICIENTS
-1.7935800 1.6543-01 2.9866-01-4.0499-01-2.7766-01 5.2550-02 8.2447-02 2.3807-02
-7.0703-03-2.3133-02 6.8030-03-2.0897-02-2.6632-02-3.2720-02-1.8053-02-2.5287-02
-5.6197-03-4.0333-04 1.0117-03 1.1917-02 4.4435-03-3.4998-03-1.5068-02-8.3073-03
-1.8186-02-4.2309-04 1.0566-02 1.4275-02 2.6792-02 2.6779-02
SPAN 4  CHORD 2         STEADY#  1.6640800
COSINE COEFFICIENTS
 1.9254800 1.4196800-4.8549-01-2.1387-01-4.6178-01-2.0788-01-5.2214-02-6.2245-02
 1.3855-01 7.1662-02 1.2143-01-2.8076-02 9.3311-02 3.7116-02 3.3236-02-7.9065-02
-2.5649-02-6.4054-02-2.6111-02-5.1895-02-1.8235-02 1.6183-02 3.6028-03 9.6549-03
 1.6620-02 4.1044-02 6.1626-03 8.9025-03-2.3564-02 3.9167-03
SINE COEFFICIENTS
-7.9952-01 7.1398-01 7.4940-01-1.9815-01-6.0630-02-2.7136-01-7.8233-02-1.6083-01
-4.7123-02-3.7802-02 4.7038-02 1.5594-02-2.5104-02 4.7073-02 6.2923-02 5.2083-02
-1.8213-02 2.6636-02-2.4713-02 1.9475-02-6.0333-02 1.4833-02-2.5057-02 1.1041-02
-3.7956-02 2.2852-02 7.6268-03 3.0766-02-6.7535-03 1.4643-02
SPAN 4  CHORD 3         STEADY#  1.1109800
COSINE COEFFICIENTS
 7.6488-01 6.2993-01-3.5769-01-2.2520-01 1.3009-01 1.3398-01 1.2370-01 1.0342-02
-1.3118-01-8.0909-02-1.9700-01 2.5813-02 3.4778-02 1.2466-01 6.5851-02-1.0015-01
-8.9782-03-9.5197-02 3.1653-02 3.4087-02 5.0123-02 1.3483-02-1.9190-02-8.3020-03
-5.2123-02 4.9681-02-1.8984-02 3.6314-02 1.5776-02-2.2453-02
SINE COEFFICIENTS
-4.1626-01 1.8368-01 2.9603-01-4.7852-01-2.9824-01 9.3601-03 1.6665-02 2.1565-01
 6.3029-02 6.2728-02-5.7216-02-1.4151-01-2.4167-02-3.4666-02 1.7017-01 3.4619-02
 2.5815-02-2.6698-02-7.9718-02 1.1229-02-7.8825-03 6.8186-02 4.0363-03 4.1701-02
-3.7331-02-2.0558-02 1.3430-02-3.5182-02 4.5702-02-2.5652-02
SPAN 4  CHORD 4         STEADY# -5.7031-02
COSINE COEFFICIENTS
 1.0097-01 2.2139-01 1.2210-01 7.5849-02-1.4001-01-1.0300-02-2.4536-02-7.7384-03
 5.0075-02-1.6996-02-4.7516-02 2.6770-02-6.9292-03-7.4781-03 1.5011-02-1.0395-02
-1.6128-02 1.0451-02 7.7227-03-1.0708-02-6.0688-03 7.7821-03-8.9027-04 2.5197-03
-4.0571-03-4.3248-03 4.2781-03 7.1494-03-1.7505-03-1.0685-03
SINE COEFFICIENTS
-5.4576-01-1.3472-01-1.4746-02 8.4265-02 4.0551-02-2.7462-02-5.7068-03-3.6138-02
 1.1193-02 5.8583-02-2.3600-02-1.4565-02 2.4995-02-1.2354-02 5.4550-03 2.0561-02
-5.5836-03-1.1342-02 1.2721-02 4.9536-03-9.6957-03 1.8488-03 2.1008-03-4.1565-04
 1.2389-03 1.1227-04-7.2288-03 9.8765-04 3.4533-03-8.6452-03
SPAN 4  CHORD 5         STEADY# -5.8878-01
COSINE COEFFICIENTS
-8.3080-02 3.9914-02 4.4827-02 4.9705-03-2.8020-02 6.5446-03 1.0631-02-5.5015-03
-1.1308-02 5.3233-03 4.4510-03-7.3973-04 1.2494-03 4.0847-03-2.4798-03-1.0872-03
 3.7422-03-2.8996-03-3.7564-04-3.5183-03-3.2536-03-5.4585-03 1.3675-03-6.3272-03
-6.7118-03 2.8503-04-7.8514-03-3.5754-03-3.7225-03 3.3623-03
SINE COEFFICIENTS
-2.7098-01-6.6386-02-1.4476-02 2.3105-02 2.0055-03-2.3576-02-2.0902-03 1.0912-02
-5.1237-03-5.3327-03 4.2315-03-1.4173-03 2.3106-03-1.5879-03 4.6499-03 1.1406-03
-2.3584-03 5.1113-04 1.4798-03 1.6460-03-1.1989-03 2.8964-03 1.5285-04 5.2953-08
 1.2698-03-3.8162-04-6.7273-03 3.8531-03 2.4502-05-7.3904-03
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TABLE IX - Concluded

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SPAN 5  CHORD 1        STEADY*  4.5892+00
COSINE COEFFICIENTS
 2.8633+00 2.7698+00 9.1614-02 4.4193-01 5.1579-02 1.0216-01-6.7607-02-5.7356-02
 8.4660-02 6.4952-02 9.6763-03-4.0066-02-4.7657-02 2.5327-02-8.5713-03-3.2209-02
-1.2784-02-2.4354-02-3.1326-02-3.2158-02-3.7541-02-3.5606-03 1.5858-02 2.8527-02
 1.6343-02 9.2622-03 4.4607-03 1.4459-02 1.6778-02-9.4630-03
SINE COEFFICIENTS
-1.3014+00 1.7734-01 4.8163-01-4.4156-01-2.3911-01 5.0871-02 4.7032-02-5.2641-02
-8.3331-02-4.8772-02-2.2755-02-1.2429-02-4.8134-03-1.1673-01-2.6348-02-2.5343-02
-3.0608-02 5.3978-03 2.0897-02 4.1260-02 8.5068-03 1.6655-02 1.3342-02 1.3835-02
 8.3063-03 8.7411-03-7.0301-03-5.5649-02-8.6941-03 1.9748-02
SPAN 5  CHORD 2        STEADY*  1.3087+00
COSINE COEFFICIENTS
 5.8805-01 7.3414-01-8.3101-01-4.0179-01 6.6345-03 1.2108-02 5.8080-02 1.1176-01
 7.7600-02 1.8018-01 5.1774-02-5.6002-02-1.7865-02-1.4554-01-8.9212-02 4.0102-02
-7.6362-03 5.3603-03 3.2117-02 3.0673-02 7.8260-02-1.9205-02-5.8138-02-1.6849-03
-4.0478-02-1.8610-02 1.1218-02-6.8134-03 2.7798-02 2.9902-02
SINE COEFFICIENTS
-2.4093-01 6.8113-01 5.6526-01-5.6885-01-3.0105-01-7.1629-02-1.3772-01-1.3542-02
-1.9872-02 2.1723-02 1.7664-01 6.2527-02 8.0349-02 5.5729-02-1.0979-01-5.7094-02
-3.2182-03-4.7143-02-1.3207-02-2.2000-02 3.6913-02 9.7585-02 1.9502-03 2.1886-03
 8.8781-03-3.7690-02-1.5275-02-1.8044-02-2.6807-02 1.3391-02
SPAN 5  CHORD 3        STEADY* -1.2170-03
COSINE COEFFICIENTS
-4.2044-01 8.1966-01-2.2005-01-3.2109-01 2.8609-02 2.6447-01 2.0720-01-1.5296-01
-1.1673-01-8.1589-02-8.0813-02 1.4809-01 7.5671-02 2.3262-02-1.0018-02-6.9505-02
-4.3227-02 9.2045-03 5.0920-02-5.1389-05-7.9441-03-1.3288-02-1.7663-02 3.6466-03
 2.5691-02 7.2725-03-1.8693-02-1.4444-02-3.8747-03 1.4549-02
SINE COEFFICIENTS
-1.1259+00-1.6904-01 5.6224-01-2.8326-01-3.0063-01-4.4096-02 2.2398-01 2.4494-01
-2.6009-02 1.0834-02-1.5503-01-1.0245-01 6.5102-02 4.2599-02 7.3504-02 1.4972-02
-3.6853-02-5.5661-02 1.7612-03 3.6214-02 1.1746-02 1.4542-02-1.0538-02-1.7226-02
-1.4107-03 2.6351-02 1.2809-02-1.6244-03-1.3184-02-9.4976-03
SPAN 5  CHORD 4        STEADY* -2.9898-01
COSINE COEFFICIENTS
-4.9155-01 1.3699-01 7.9957-02 5.4904-02-9.1894-02-2.1110-03 5.8429-03-5.7488-03
-1.8761-03-1.5937-02-6.2445-03 2.8863-04-4.9712-03-5.7009-03 2.7911-03 3.6283-03
 2.6452-04-1.6967-03-4.3513-03-6.1058-04-6.8322-03-5.0659-03-5.2010-03-4.8705-03
-5.1444-03-4.7818-03-4.2085-03-3.2433-03-1.3762-03-2.5017-04
SINE COEFFICIENTS
-3.6452-01-2.0124-01 4.1346-03 2.2739-02 2.3865-02-3.9308-02-2.1961-02-8.7742-03
 5.4129-03 5.4569-03-5.8893-03 2.5616-04 6.2542-03-1.6618-03-1.0369-03 1.9410-03
 2.2989-04-2.3096-03-5.8958-03-4.7214-03-1.8487-03-3.1720-03-1.3685-04 2.4101-04
 1.1800-03 2.5333-03 2.1945-03 3.3253-03 1.4362-03 2.4963-03
SPAN 5  CHORD 5        STEADY* -5.6370-01
COSINE COEFFICIENTS
-1.5708-01-2.3667-03 2.6760-02 3.1444-02-2.8040-02 5.1128-03 1.1036-02-1.1794-03
-9.3548-03-7.4234-03 1.6355-02 1.3589-02 1.5759-02-4.6509-02-1.5987-03 4.1420-03
-4.6091-03-8.6759-03 9.5424-04 6.2858-03 2.2362-03-8.4122-04-6.7600-03-6.8967-03
-1.9119-03 6.5765-03 1.2308-02-2.0583-03-6.6752-03-6.0387-03
SINE COEFFICIENTS
-3.0373-01-5.6127-02-1.7757-02 1.2359-02-1.0442-02-3.6979-02-1.4981-02 7.3772-03
-9.9536-05-2.6300-03-6.9568-03 5.8757-03 1.1404-02-8.6524-03-7.6217-03 2.6439-03
 4.5117-03-2.9020-03-4.0178-03-9.0200-03-1.7294-03-3.0837-03-7.0056-04-4.6568-03
-4.3504-03-3.7263-03 3.9826-03 1.1402-02 2.3687-03-1.2653-02
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TABLE X. AERODYNAMIC DATA - 170-KNOT, WEST-TO-EAST FLIGHT

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BURST NO. # 19             *** ROTOR NOISE PUNCHED OUTPUT ***
BLADE PITCH HARMONICS
 1.5280801 4.6161800-8.7611800  %COLLECTIVE, LONGITUDINAL, LATERAL RESPECTIVELY%
ROTOR FLAPPING ANGLE HARMONICS
 1.7527800 6.5371-01 0.0000     %POSITIVE TAIL HIGH -- DEGREES%
DIFFERENTIAL PRESSURE HARMONICS FOR 5 CHORD STATIONS AT EACH OF THE 5 SPANS
%MEASURING FROM THE LEADING EDGE AND THE BLADE ROOT RESPECTIVELY%.
SPAN 1  CHORD 1          STEADY#  1.1973800
COSINE COEFFICIENTS
-1.1367800 1.3108800-6.7139-01-2.4904-01-1.8298-01 1.1502-01-1.0455-01-3.6747-02
-1.3179-02-2.2318-02-1.3193-02-2.4750-02-1.3826-02-2.0115-02-1.3912-02 1.4478-03
 8.1159-03 3.2395-02 1.7598-02 2.3198-02 2.1458-02 2.1137-02 4.5993-03 8.9851-03
 3.6702-03-2.9763-03-9.0618-03-1.2432-02-8.3881-03-8.9101-03
SINE COEFFICIENTS
 2.5000-01 1.2900-01 7.6152-01-1.4656-02-1.4885-01 4.1248-03 5.2221-02-3.3884-02
-2.7906-02-2.3118-02-5.0657-02-1.7068-02-3.4766-02-1.3425-02-1.9280-02-8.5524-03
-9.5864-03-2.0204-02-2.0293-02-1.8647-02-7.3041-03-9.7300-04-1.3684-03 8.8973-03
 1.0487-02 6.8672-03 2.2152-02 5.5265-03 5.0289-03-1.4249-03
SPAN 1  CHORD 2          STEADY#  4.9342-01
COSINE COEFFICIENTS
-3.6947-01 4.6739-01-2.1656-01-9.7127-02-6.2233-02 3.8409-02-4.9838-02-1.0236-02
-5.9475-03-3.1078-03 3.0284-03-1.3065-02 5.8492-04 3.4335-03 6.8378-03 1.3640-02
 2.4571-02 3.8422-02-3.9667-03-9.3191-03-6.7050-03-7.3627-03 9.1109-03-5.1459-03
 2.0327-03 1.3526-02-1.5329-02-7.1691-03-1.9573-03-1.4850-02
SINE COEFFICIENTS
 2.3733-01 2.6322-03 2.9927-01-2.0120-02-5.0622-02 2.2213-02 2.6359-02-1.2497-02
-1.8904-02-2.5759-02-1.4958-02-8.3016-03-1.8700-02-4.4546-03-2.7752-02 1.5458-03
 1.2279-02-3.0079-02-3.3254-02-4.6184-03-8.7101-03-1.5998-03 2.1437-02-1.6904-02
-2.1729-03-5.1581-03 1.4750-03 5.3046-03-8.1535-03 9.1407-03
SPAN 1  CHORD 3          STEADY#  2.5332-01
COSINE COEFFICIENTS
-2.4255-01 3.2970-01-1.3899-01-7.1937-02-5.2919-02 3.2497-02-1.4971-02-2.3581-03
-6.3584-03-3.4566-03-4.4624-03-7.0270-03-1.1920-02-8.1572-03-4.4644-03-1.1015-03
 4.1813-03 6.3851-03 1.0687-02 7.2686-03 8.1210-03 6.6332-03 2.5336-03 5.9474-03
 4.7865-03-2.0453-03 1.9310-04-5.0108-04-7.3823-03-4.2828-03
SINE COEFFICIENTS
 9.2377-02-3.2150-02 1.5880-01 5.3901-03-3.4096-02-4.5502-04 1.7769-02-6.2028-03
-1.3157-02-5.8220-03-1.1508-02-8.8312-03-1.1315-02 6.6187-04-5.8479-03-2.6673-04
 1.8176-03-1.5762-03-1.2637-03-8.7870-03-3.0350-03-2.6617-03 1.5921-04-1.3123-03
 5.3732-04 7.5655-04 1.2317-03-3.8901-05 3.2116-03-6.4994-04
SPAN 1  CHORD 4          STEADY#  0.0000
COSINE COEFFICIENTS
 0.0000    0.0000    0.0000    0.0000    0.0000    0.0000    0.0000    0.0000
 0.0000    0.0000    0.0000    0.0000    0.0000    0.0000    0.0000    0.0000
 0.0000    0.0000    0.0000    0.0000    0.0000    0.0000    0.0000    0.0000
 0.0000    0.0000    0.0000    0.0000    0.0000    0.0000
SINE COEFFICIENTS
 0.0000    0.0000    0.0000    0.0000    0.0000    0.0000    0.0000    0.0000
 0.0000    0.0000    0.0000    0.0000    0.0000    0.0000    0.0000    0.0000
 0.0000    0.0000    0.0000    0.0000    0.0000    0.0000    0.0000    0.0000
 0.0000    0.0000    0.0000    0.0000    0.0000    0.0000
SPAN 1  CHORD 5          STEADY#  1.9879-01
COSINE COEFFICIENTS
 1.4060-02-6.9589-02-4.8070-04 1.1378-02 7.6102-03-3.5549-03-2.6610-03-3.9084-03
 1.6526-04 2.8098-03-2.7621-04-8.3939-04 5.4645-04 1.0756-03-3.5241-04 1.4721-03
-7.6911-04-2.0853-03-1.5528-03-9.5559-04 2.1007-04-5.3746-04 2.3741-04 5.8692-04
 1.8508-03 1.9327-03 2.0337-03 6.9061-04 1.5003-04 2.2547-04
SINE COEFFICIENTS
 3.4337-02 6.2483-03 1.0394-02-6.5110-04-5.6964-03-2.6736-03-1.0309-03 3.5232-04
 3.4044-03-1.0822-03-8.6063-04-9.7629-05 1.7111-03-2.0164-03-8.3581-04-1.7685-03
-1.3681-03-2.3302-04-2.3168-03 1.0103-03 2.0814-03 1.3958-03 5.7364-04 1.7987-03
 7.4468-04 6.4562-04-2.6219-04-2.2776-05 9.7369-05-1.8398-05
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TABLE X - Continued

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SPAN 2  CHORD 1        STEADY#  4.6124800
COSINE COEFFICIENTS
 1.9253-01 2.9756800-9.5601-01 2.2914-01-2.5519-01 8.8947-02-8.0210-02-1.5388-01
 1.3710-02 7.5670-03-6.0277-02 4.4355-02-3.6226-02 1.4924-02 1.8955-02-1.5061-02
 2.8432-02-7.2381-03-1.6696-02 2.8084-02-3.2443-02 3.3962-02-3.7309-02 8.8503-03
-7.7774-03 3.4515-04-7.4425-03-1.0249-02-6.6665-03 2.1901-02
SINE COEFFICIENTS
 4.0948-01 9.4962-01 1.4237800-6.9900-01 1.0139-01-1.3778-01 2.2708-01-1.0693-01
-7.3644-02-2.2223-02 7.2081-03-7.2343-02 4.9756-02-1.0292-01 4.8609-02-5.4614-02
 2.6820-02-2.6968-02-1.3697-03-1.5436-02 1.8464-02-2.7702-02 3.6250-02-3.7697-02
 3.4232-02-2.6995-02 5.2480-03-1.3081-02-1.1735-02-5.5445-03
SPAN 2  CHORD 2        STEADY#  1.7404800
COSINE COEFFICIENTS
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 3.2250-02 6.6024-03-3.0100-02 1.1710-02-3.4868-03 4.5987-04 8.5262-03-1.2787-02
 1.2169-03-4.9179-03 8.6680-04-3.3315-03-3.7060-03 8.4274-03-7.9745-03-1.6020-03
 2.9807-03-8.9656-04 4.4142-03-8.5993-03 5.8597-03-1.4180-03
SINE COEFFICIENTS
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-3.3535-03 3.0828-04-6.0092-03-9.8580-04-4.1285-03 8.4414-03
SPAN 2  CHORD 3        STEADY#  1.5237800
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 8.1262-02 6.5431-01-1.4249-01-5.2956-02-3.2219-02 5.9177-02 1.5874-02-3.7463-02
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 3.3589-03-4.3153-03-1.4316-03-6.2515-04-1.0554-03 2.1242-03 1.8599-03 5.6400-04
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 8.6647-04-4.5070-03-5.4327-03-1.7446-04 7.2570-04-2.0546-03 3.0642-04-3.2652-03
 2.9924-03-2.9127-03-5.4843-03 2.1334-03-4.2069-03 2.3390-04
SPAN 2  CHORD 4        STEADY#  2.9323-01
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-1.6264-03 4.7190-03 6.3045-03-8.4076-04 2.6271-04 2.9666-03 1.0130-03 2.1207-04
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-1.1832-04 6.0177-04-1.4184-03 9.8242-06-4.1174-04 8.2307-04
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 1.0141-03-2.3174-03 1.3301-03-2.1744-03-5.5543-04 1.0258-05-9.0937-04 1.1398-03
 2.4669-04 3.3228-04-1.3727-03-1.1221-04-4.9498-04-1.0926-03
SPAN 2  CHORD 5        STEADY# -2.5088-01
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 1.2016-05 4.4918-05 2.9935-03-1.5641-03 1.6956-03 9.3242-04-2.1451-03-2.2294-04
-7.8625-04 3.4630-03 7.1393-04-3.8537-03 2.8193-03 2.0065-04-1.0957-03-6.6331-04
 9.9925-04 2.6500-03-1.4297-03-6.1512-04 8.9138-04-1.0273-03
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 2.5174-03-3.2163-03-6.2892-05-1.0494-03-2.2371-03 1.8348-03 4.3339-05 5.1338-04
-1.5340-03 8.3623-04 2.1490-03-2.1509-03-2.2254-03 1.5762-03 8.5232-04 7.6588-05
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TABLE X - Continued

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 2.7806-02-3.0208-02-1.7657-02 8.5854-03 1.7431-02-2.4162-02 1.0128-02-7.0481-03
-1.9012-02 1.1265-02-1.4417-02-6.9734-03 8.3555-04-9.7029-03
SINE COEFFICIENTS
-5.3778-01 9.2845-01 1.0751800-7.1621-01-2.8421-01 1.8801-01 1.8706-02-2.2640-02
 3.5427-02-2.6523-02 9.7373-03 3.8547-02 5.3822-03-2.9572-02 6.1056-02-3.9061-02
 8.8835-03 1.7425-02-4.5315-03-2.0560-02 1.4312-02-9.8788-03 1.1530-03-4.6008-03
 2.5453-03-1.1491-02 1.4197-02-2.7154-02-7.1005-04 9.9767-05
SPAN 3  CHORD 2         STEADY#  2.3380-01
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 6.8495-03-2.9085-02 2.1024-02 2.1425-02-1.3363-02 1.5526-02-2.7824-02 1.2228-02
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 7.2676-03-5.8507-03 2.8715-03-1.6781-02 2.6084-02-4.1637-04
SINE COEFFICIENTS
-1.4632800 3.9582-01 5.9230-01-3.3543-01 6.1987-03-7.0688-02 2.5137-03 7.5905-02
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-1.3368-02 7.9531-03 3.3842-02-2.5649-02 1.3526-02-1.5517-02 2.7768-03-1.7941-02
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SPAN 3  CHORD 3         STEADY# -2.2684-01
COSINE COEFFICIENTS
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 5.2347-02-1.8550-01 8.5287-02 9.4112-02-4.5092-02 1.2930-02-4.7280-02 2.7945-03
 3.1735-02 1.5313-02-2.1844-02-2.7991-03 1.4248-02-3.4706-02 2.7301-02-1.0044-06
-1.5110-02 3.5329-02-2.4101-02-1.8840-02 2.5236-02-7.7286-03
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SPAN 3  CHORD 5         STEADY# -1.6344-01
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 7.3493-04-3.6981-04 7.7213-04-8.9325-05 8.1435-05-7.1852-04
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-6.4777-03 7.9592-04 3.5832-02-4.6360-03-3.0979-02-4.5333-02-4.2888-02-4.4131-02
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SPAN 4  CHORD 2        STEADY#  1.4744&00
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SPAN 4  CHORD 3        STEADY#  1.0017&00
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-6.1539-02 2.0800-02 9.4498-03 6.9153-03 4.7034-02-3.6635-02
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SPAN 4  CHORD 4        STEADY# -4.3401-02
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-1.3746-03 1.1940-03 7.8258-03 3.3101-04-6.3593-03-1.8023-04
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TABLE X Concluded

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SINE COEFFICIENTS
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-1.5526-02-3.8571-02 5.6404-03 8.4011-03 4.1529-02 3.5647-02 2.3119-02 1.6471-02
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SPAN 5  CHORD 2         STEADY#  1.2520800
COSINE COEFFICIENTS
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-3.2074-01-1.9110-01 7.9528-03 1.9418-02 2.9890-02-4.5022-02-2.6775-02-8.1156-03
 5.3649-03 3.3914-03-1.0311-02-7.9115-03-6.2563-04 4.9735-04 5.1116-04 5.1458-03
 5.1098-03 6.8762-03 5.7814-03 5.4434-03 9.7513-03 8.6038-03 9.6596-03 8.6771-03
 6.7609-03 7.4923-03 5.4650-03 3.8115-03 2.8083-03 2.2467-03
SPAN 5  CHORD 5         STEADY# -5.0105-01
COSINE COEFFICIENTS
-1.7749-01-6.0144-03 1.3876-02 3.0909-02-2.6989-02 1.9709-03 1.0931-02 6.7939-03
-2.5439-03-1.1020-02 9.6259-03 5.3299-03 1.0945-02-3.2643-02-5.1064-04-2.3541-03
-3.7777-03-6.0282-03 2.9022-03-1.7787-03-4.6323-03-6.8709-04-3.3911-03 5.0265-03
-4.3233-03 2.0855-03-4.2973-03 3.6942-03 3.2752-04 1.7731-03
SINE COEFFICIENTS
-2.7422-01-5.4820-02-1.6145-02 1.1136-02 6.2709-03-4.1626-02-1.8555-02 1.8362-03
 1.3022-03-1.0041-02-1.4302-02-9.0268-03-1.1211-02 3.9885-02-5.3402-04 7.1120-03
 3.3042-03 7.6460-03-4.9142-03 8.5319-03-1.0004-03 3.1839-03 8.5765-04 2.0242-04
 7.6982-03-6.9246-04 4.4177-03 4.2896-03 5.2101-03-6.3603-03
```

TABLE XI. AIRCRAFT TRIM CONDITIONS				
Nominal Airspeed (kt)	Calibrated Airspeed (kt)	Aircraft Heading (deg)	Rotor Speed (rpm)	Shaft Angle (deg)
0	0	030	188	-1.7
0	0	210	188	- .7
0	0	270	188	- .9
120	115	290	188	-3.7
120	116	110	188	-4.9
140	139	290	190	-4.8
140	139	110	189	-4.8
170	163	290	189	-5.7
170	164	110	188	-6.3

APPENDIX III
PREDICTED AERODYNAMIC LOADING

Tables XII through XV contain 10 predicted harmonics of aerodynamic section loading (pounds per inch of span) for forward flight and for hover. These section loading data include the effects of variable inflow from a prescribed helicoidal wake analysis and the effects of blade motions from a normal modes blade dynamics analysis. Ten harmonics of loading are considered to be the practical limit of the section loading prediction method in its present form.

Airpseed: 170 kt　　Blade Pitch at Root: 18.067°　　A_{is}: 2.000

Inflow : Variable　　Rotor Shaft Angle : -8.468°(fwd)　　B_{is}: -9.000

TABLE XII. 170-KNOT CRUISE AIRLOADS (lb/in.)

Airloading Harmonic Number	98.5% SPAN		94.1% SPAN		88.3% SPAN		79.8% SPAN		38.3% SPAN	
	Cosine	Sine	Cosine	Sine	Cosine	Sine	Cosine	Sine	Cosine	Sine
STEADY	0.2771		34.8891		34.9268		30.6087		5.9336	
1	-.3275	.3149	-9.0662	12.1640	-5.9314	4.6795	-3.8742	-.5892	3.7311	-4.2441
2	-.3564	-.0676	1.3862	16.7727	1.4551	20.5090	1.3202	23.2733	-1.1523	5.9897
3	-.1347	-.2584	5.6775	6.5508	8.0448	7.1403	8.4552	3.6182	3.6033	.4125
4	+.1079	-.1625	-.6739	2.8777	.7224	-.1272	.3464	-1.2710	1.4280	.5723
5	+.1797	.0154	2.2296	-.4683	.6613	-.7593	1.5272	.4423	.7080	-.7097
6	+.0540	.1004	-.8972	-1.0289	-.0049	.1595	-.4684	.0143	-.1915	.0865
7	-.0537	.0771	1.3638	1.3896	.9864	.3238	-.0071	.4053	.3450	.2323
8	-.0495	-.0051	1.2948	.0716	.1464	-.1356	.6739	-.0662	-.2825	.0457
9	-.0002	-.0427	.8053	-.7882	.8975	-.2760	.2308	.2128	.8711	.1797
10	+.0215	-.0145	-.3447	-.8009	-.3272	-.7493	-.1277	-.0924	-.5503	-.9153

Airspeed: 140 kt | Blade Pitch at Root: 13.801° | A_{1s}: +2.000

I ow : Variable | Rotor Shaft Angle : -6.650°(fwd) | B_{1s}: -5.000

TABLE XIII. 140-KNOT CRUISE AIRLOADS (lb/in.)

Airloading Harmonic Number	98.5% SPAN Cosine	98.5% SPAN Sine	94.1% SPAN Cosine	94.1% SPAN Sine	88.3% SPAN Cosine	88.3% SPAN Sine	79.8% SPAN Cosine	79.8% SPAN Sine	38.3% SPAN Cosine	38.3% SPAN Sine
STEADY	0.0432		32.1562		32.9131		29.1304		5.5119	
1	.0344	.0059	+12.0380	-3.4406	4.6208	-3.9159	-1.3674	-3.5540	-3.0354	4.4670
2	-.0175	-.0069	3.3554	-5.6222	8.2819	-5.7225	12.1635	-3.0718	2.5126	-.7131
3	-.0075	-.0149	4.6631	-.8978	5.8059	2.1099	3.0618	3.2793	.4691	1.0319
4	+.0026	-.0069	.2990	-.5617	-1.0220	-.8627	.3693	-2.9325	.5579	1.0731
5	+.0009	-.0002	-.3969	-2.4232	.0375	-2.9653	-.0366	.0693	-.8611	.5496
6	-.0034	-.0024	.3872	-1.2138	1.1321	.4331	-.1178	-.2770	-.5274	-.2659
7	+.0042	-.0042	1.7338	-.0734	.0770	.3897	.7934	.2279	-.0889	-.9283
8	+.0037	+.0050	.2188	1.3698	.5892	-.3548	.0491	-.6395	1.3744	.1140
9	-.0035	+.0029	-.4309	-.8629	.5336	-.4563	.8525	-.0403	-.5071	1.1284
10	-.0034	-.0028	-.1201	-.1418	-.6592	.4934	-1.3641	1.1039	-.4840	-.6068

Airspeed : 120 kt   Blade Pitch at Root: 12.600° A_{1s} : -1.500

Inflow : Variable   Rotor Shaft Angle : -4.170 (fwd) B_{1s} : + 5.000

TABLE XIV. 120-KNOT CRUISE AIRLOADS (lb/in.)

Airloading	98.5% SPAN		94.1% SPAN		88.3% SPAN		79.[illegible] SPAN		38.3 SPAN	
Harmonic Number	Cosine	Sine	Cosine	Sine	Cosine	Sine	Cosine	Sine	Cosine	Sine
STEADY	0.0467		35.4338		35.8693		32.0217		6.7611	
1	.0307	.0013	+8.7841	-3.3866	2.0889	-3.9953	-2.4914	-3.6462	-2.4743	4.6143
2	-.0138	-.0096	2.3521	-6.2696	7.1741	-6.0052	11.1633	-1.5397	1.9734	-.8133
3	-.0078	-.0144	3.6054	-1.6737	4.6207	1.4388	.4686	.8783	.3839	.3178
4	+.0030	-.0056	1.2238	-1.1348	-.3132	-1.9736	1.5938	-4.3840	1.9376	.7998
5	.0027	.0035	-.5474	-1.3549	-.6322	-1.8785	-.7179	1.3471	-1.2212	2.0714
6	-.0025	.0009	.5069	-.8239	1.0478	.1487	.4944	-1.1818	-1.0441	-1.5058
7	.0025	-.0024	1.3055	1.2260	.5708	.8813	.3239	-.1144	1.3853	-.9341
8	.0044	.0040	-.1527	.5486	.[illegible]72	-1.2566	-.2277	-1.4106	.4869	1.8736
9	-.0035	.0032	-.0811	-.3725	1.1232	.4458	1.8609	2.3049	-1.4299	-1.0215
10	-.0033	-.0034	-.4420	-.6011	-.6988	.5848	-2.0736	.4954	1.4369	.1567

Airspeed : Hover   Blade Pitch at Root: 12.799° A_{1s}: 0.0

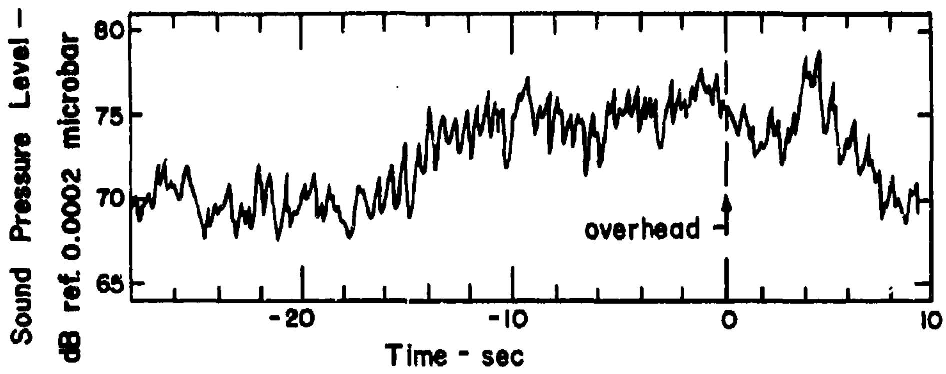
Inflow : Variable   Rotor Shaft Angle : 0.0 B_{1s}: 0.0

TABLE XV. HOVER AIRLOADS (lb/in.)

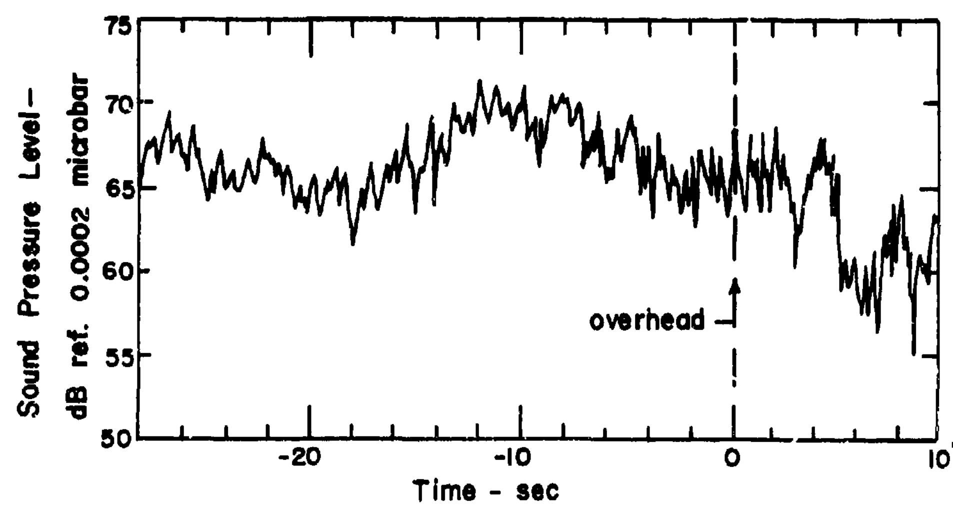
Airloading	98.0% SPAN		95.0% SPAN		85.0% SPAN		75.0% SPAN		40.0% SPAN	
Harmonic Number	Cosine	Sine	Cosine	Sine	Cosine	Sine	Cosine	Sine	Cosine	Sine
STEADY	0.0373		33.2492		30.7245		26.4747		8.236	
1	-.0001	-.0001	-.0570	-.0846	-.0387	-.1043	-.0195	-.1215	.0079	-.0322
2	.0	-.0001	-.0153	-.0490	-.0168	-.0531	-.0140	-.0503	.0149	-.0122
3	-.0001	-.0001	-.0491	-.0761	-.0522	-.0614	-.0471	-.0394	.0092	.0157
4	.0	.0	-.0063	-.0367	-.0221	-.0545	-.0371	-.0606	-.0036	.0170
5	-.0003	.0	-.1110	-.0349	-.0307	-.0902	.0315	-.1301	-.0368	.0152
6	-.0001	-.0001	-.0357	-.0346	+.0149	-.0165	.0519	.0080	.0015	.0413
7	.0	-.0001	-.0164	-.0551	.0037	-.0360	.0204	-.0192	-.0092	-.0076
8	.0	-.0001	-.0171	-.0402	-.0053	-.0239	.0060	-.0104	-.0058	-.0072
9	-.0001	-.0001	-.0313	-.0284	-.0170	-.0186	-.0029	-.0091	-.0061	-.0053
10	-.0001	.0	-.0276	-.0252	-.0137	-.0174	-.0017	-.0096	-.0062	-.0036

APPENDIX IV
MEASURED ACOUSTIC OCTAVE DATA

Octave band noise data for the forward flight cases is presented in Figures 53 through 55 as plots of SPL vs time. These data are for flyovers at an altitude of 1000 feet for the nominal airspeeds given in the figure titles. Figure 56 presents azimuthal plots of the noise level in each octave. Levels tend to be highest in the vicinity of 330 degrees of azimuth, corresponding to the occurrence of RIN as explained in Section 4.2.1. Figures 57 and 58 are included to show the difference between typical RIN and no-RIN hover noise observed during this program. Each spectrum is an average of 16 spectra. Averaging tends to broaden the peaks of the discrete frequency components because of slight variations in rotor rotational speed and small deviations due to lead-lag motion of the rotor blades.

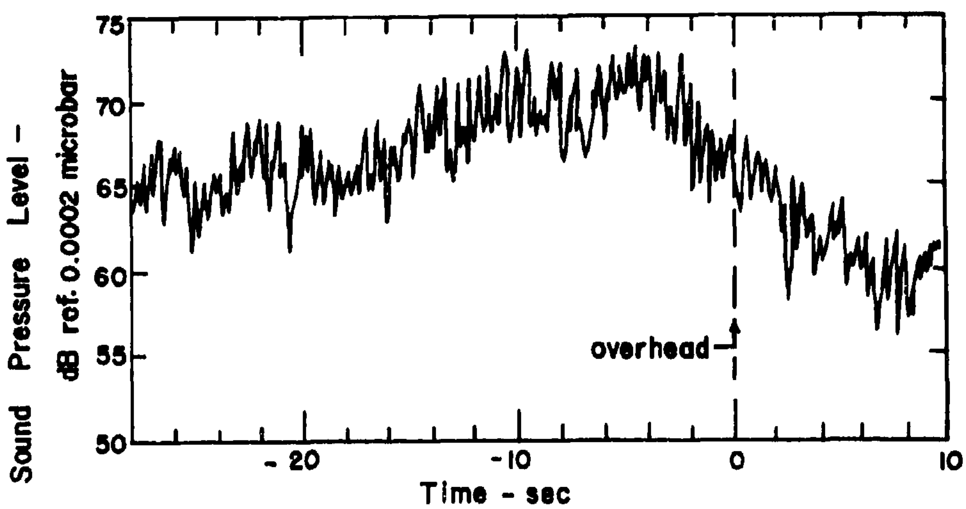


a. Overall

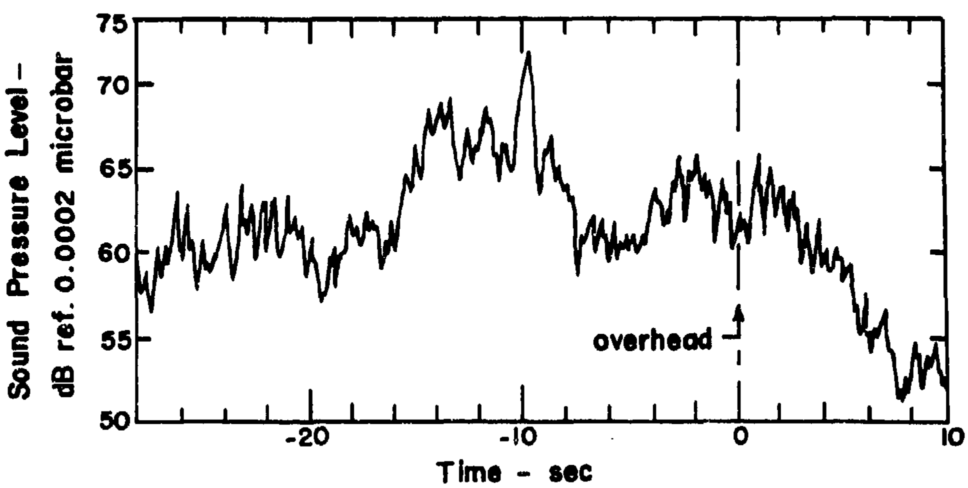


b. 31.5 Hz Octave

Figure 53 Octave Band Flyover Noise - 120 kt.

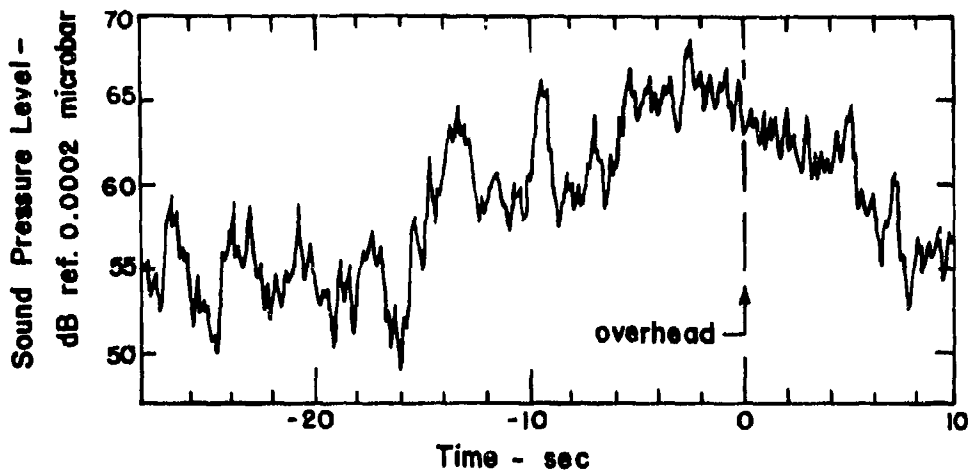


c. 63 Hz Octave

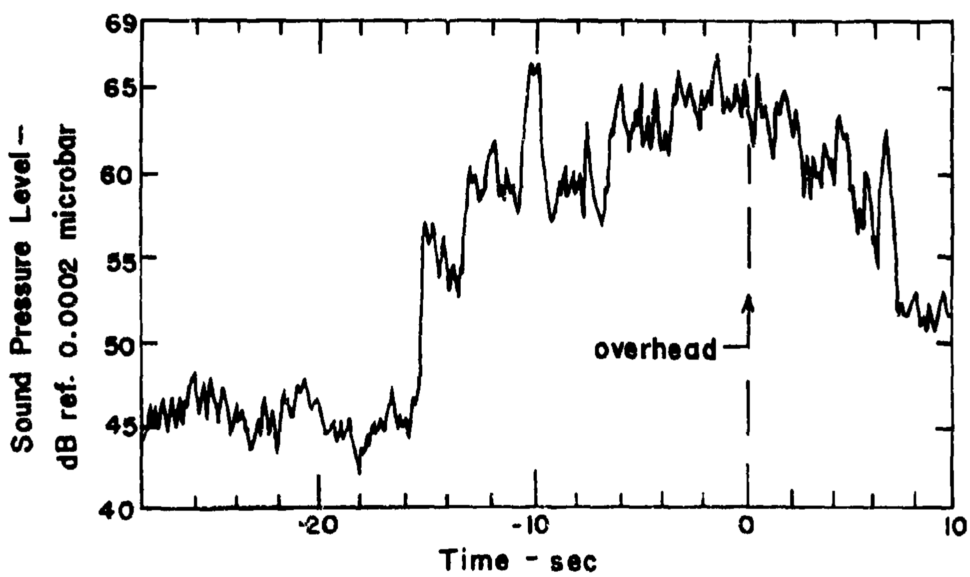


d. 125 Hz Octave

Figure 53. Continued.

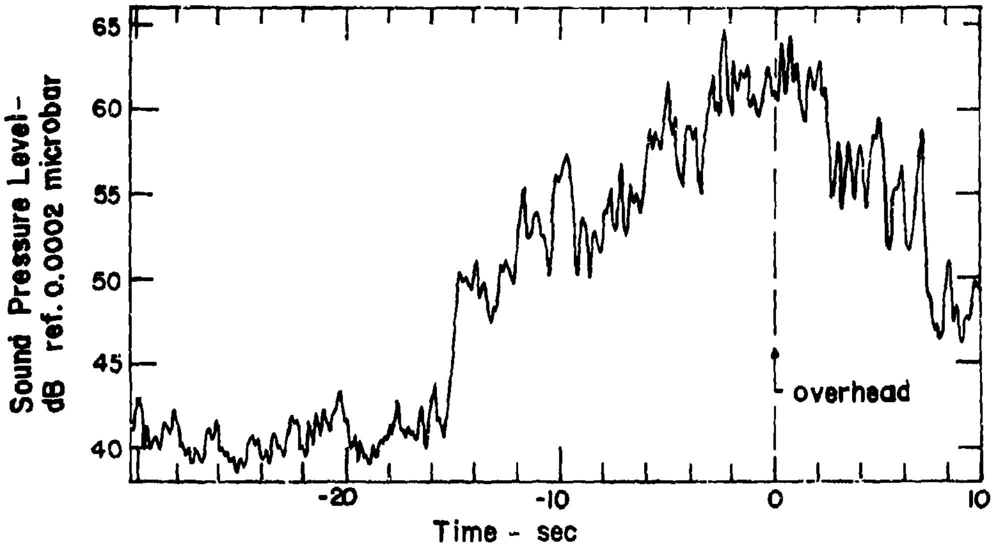


e. 250 Hz Octave

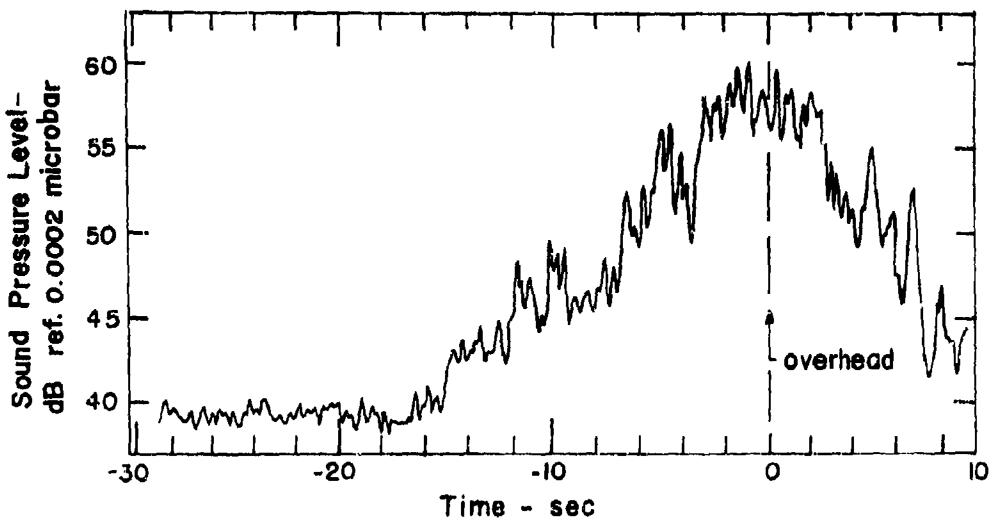


f. 500 Hz Octave

Figure 53. Continued.

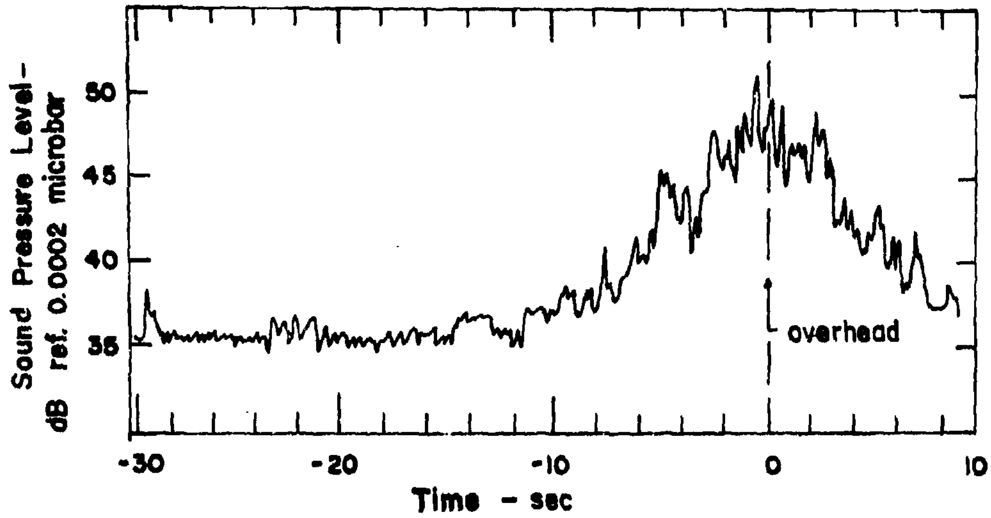


g. 1000 Hz Octave



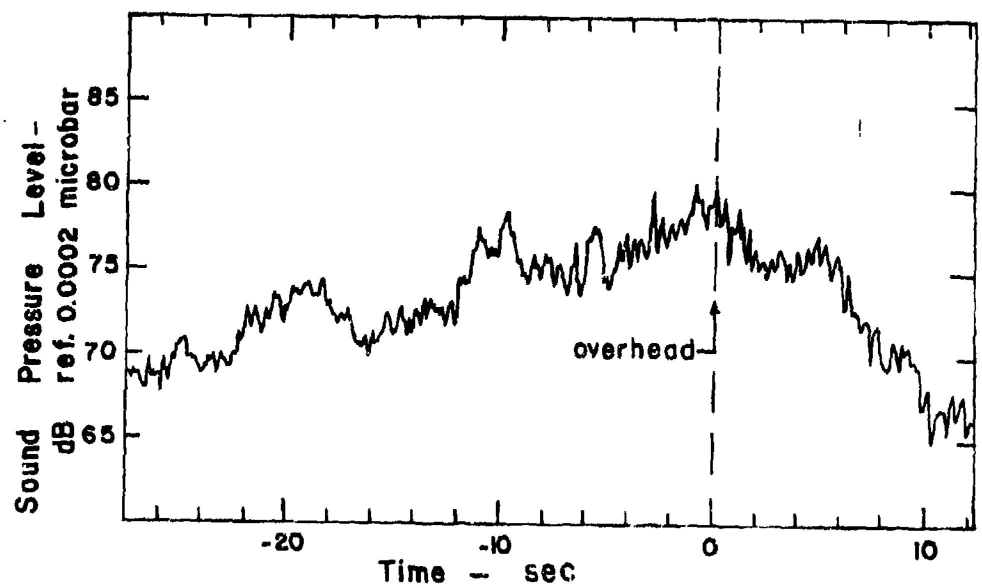
h. 2000 Hz Octave

Figure 53. Continued.



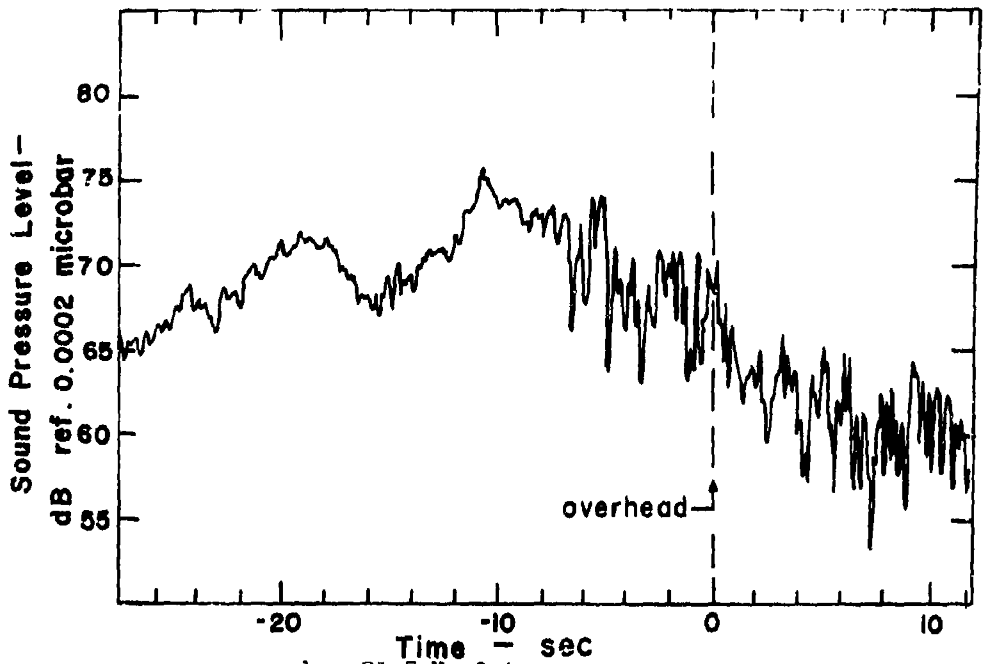
i. 4000 Hz Octave

Figure 53. Concluded.

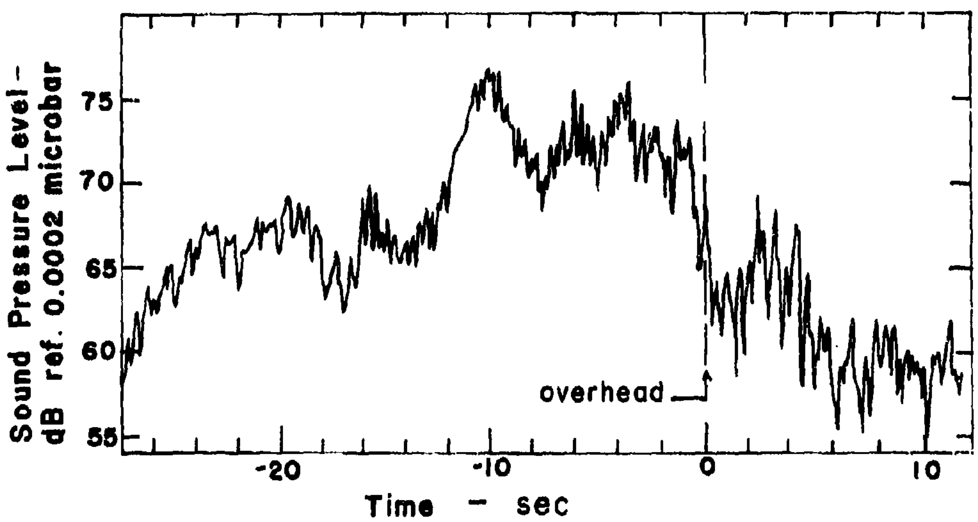


a. Overall

Figure 54. Octave Band Flyover Noise - 140 kt.

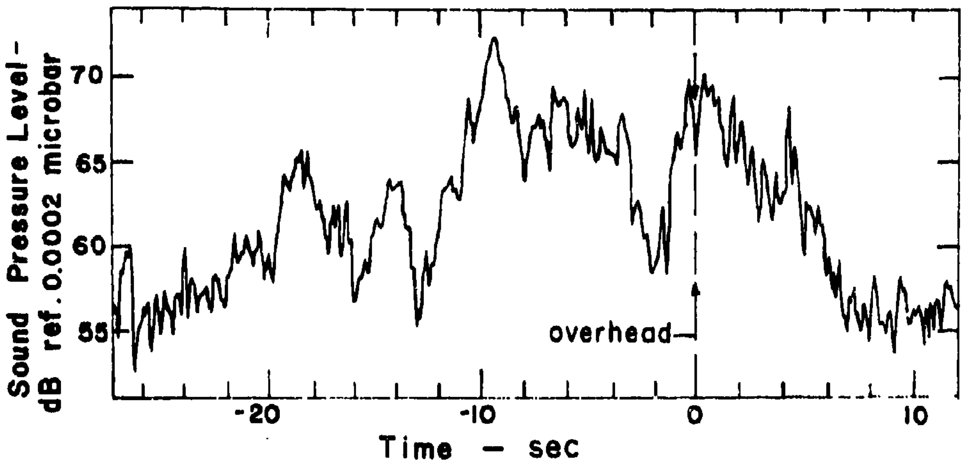


b. 31.5 Hz Octave

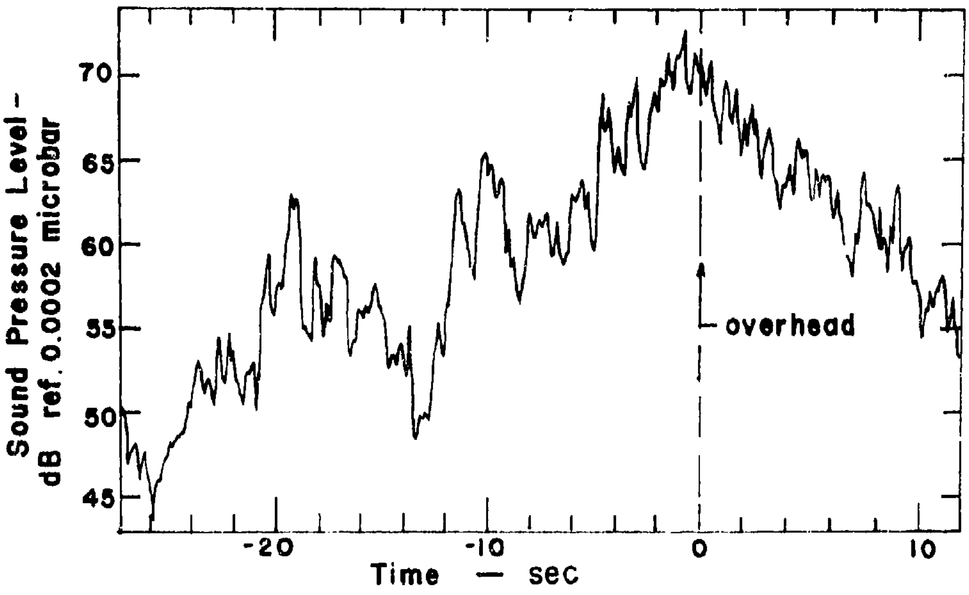


c. 63 Hz Octave

Figure 54. Continued.

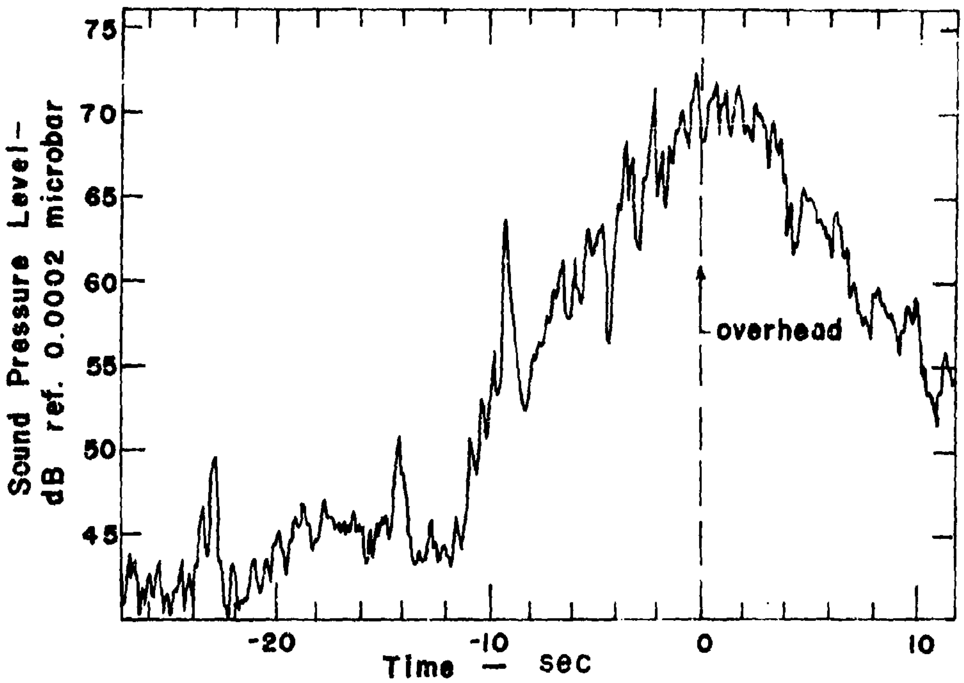


d. 125 Hz Octave

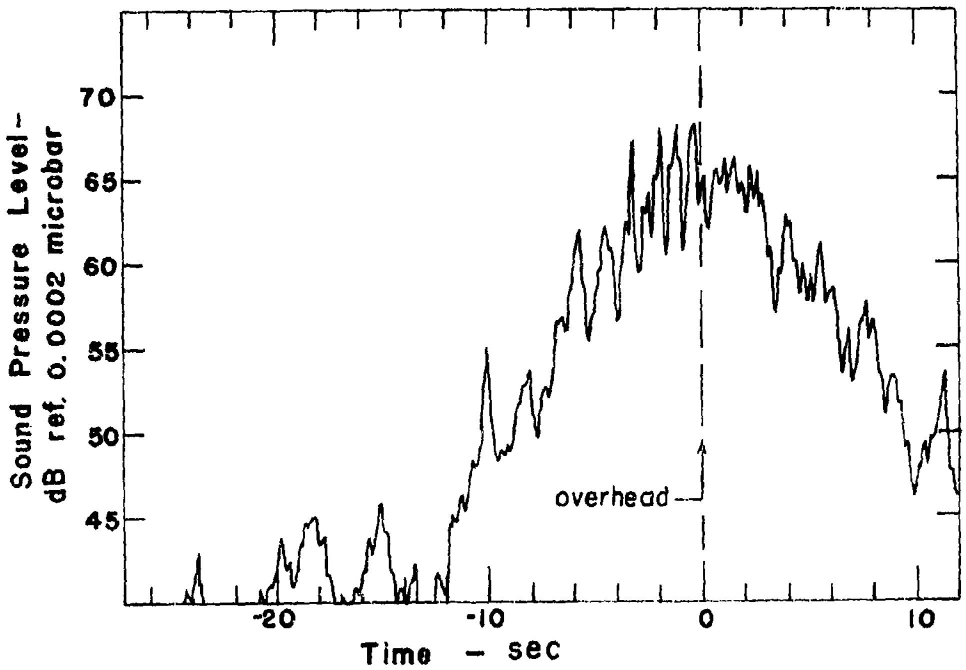


e. 250 Hz Octave

Figure 54. Continued.

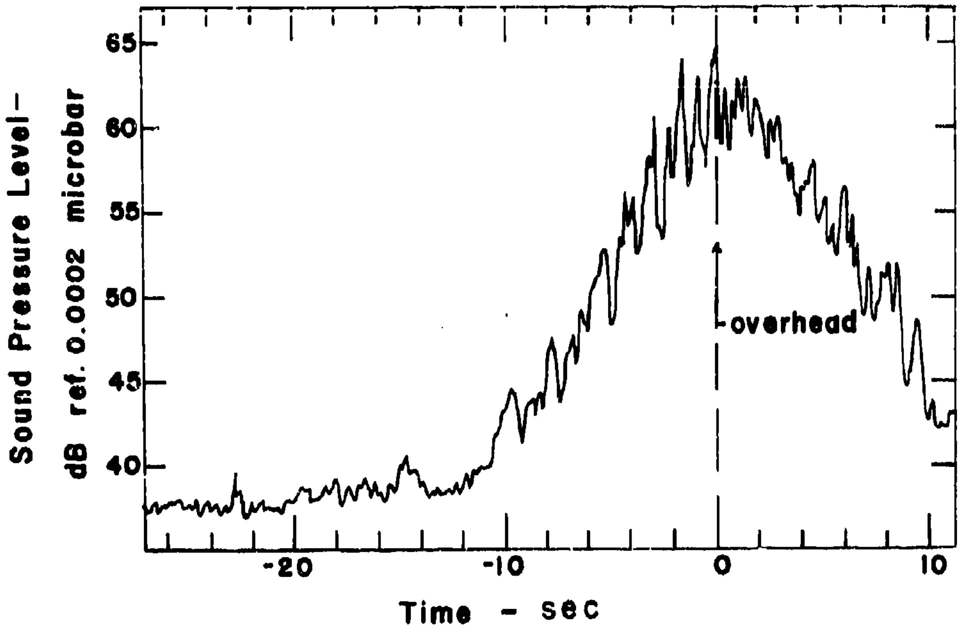


f. 500 Hz Octave

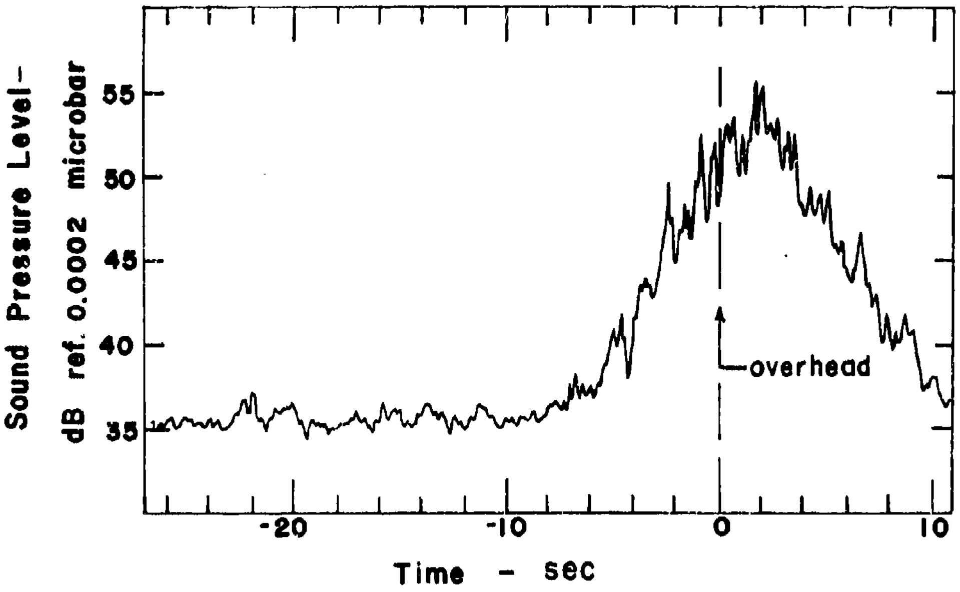


g. 1000 Hz Octave

Figure 54. Continued.

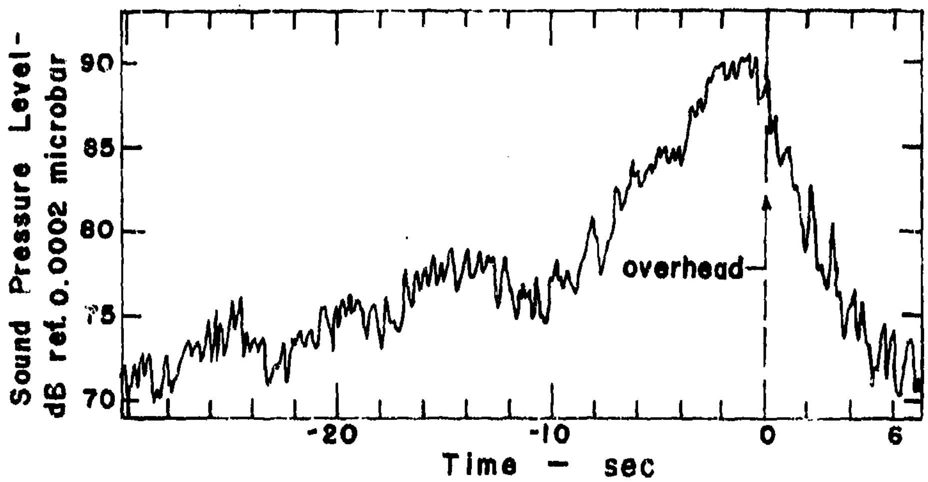


h. 2000 Hz Octave

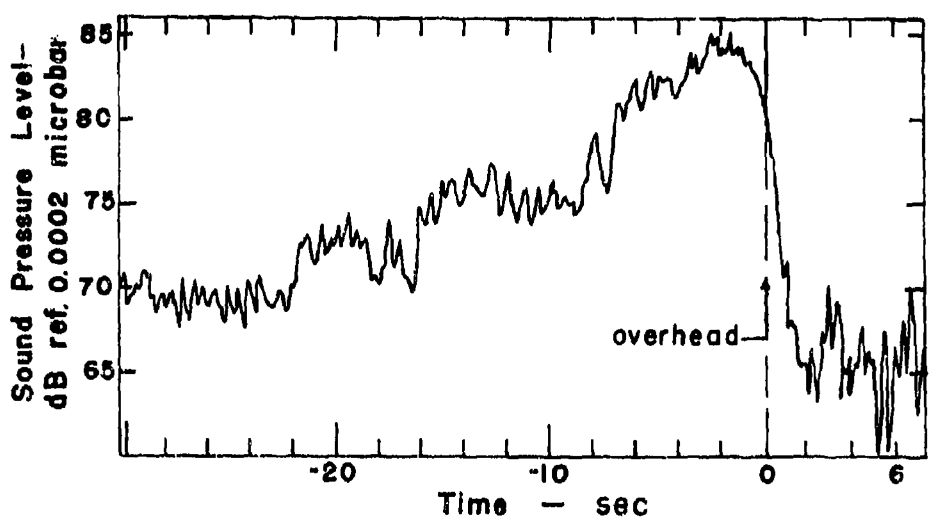


i. 4000 Hz Octave

Figure 54. Concluded.

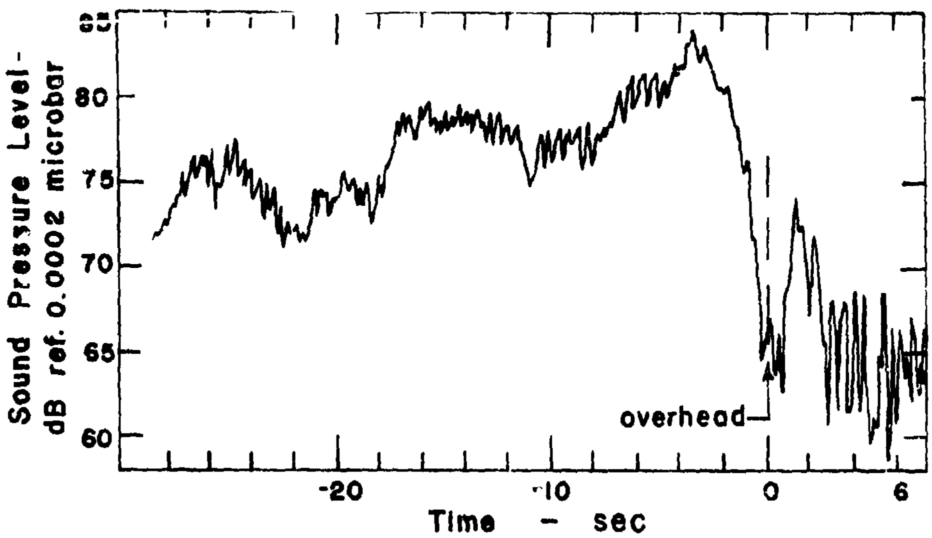


a. Overall

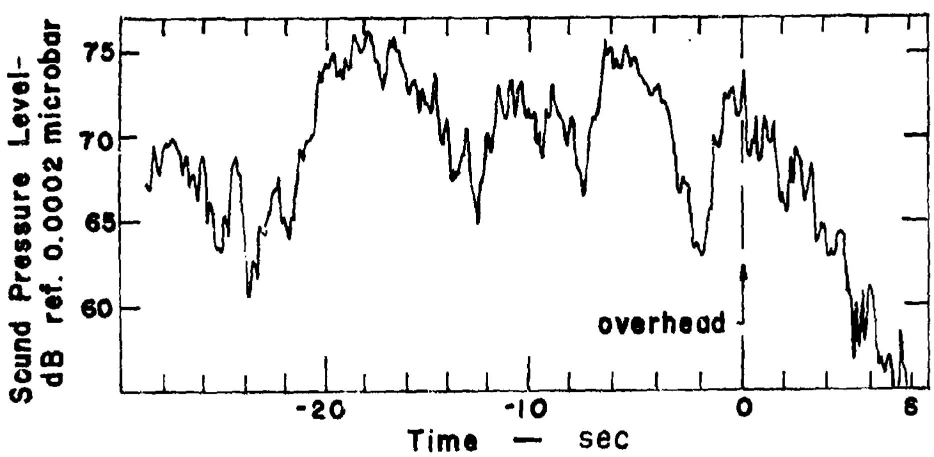


b. 31.5 Hz Octave

Figure 55. Octave Band Flyover Noise - 170 kt.

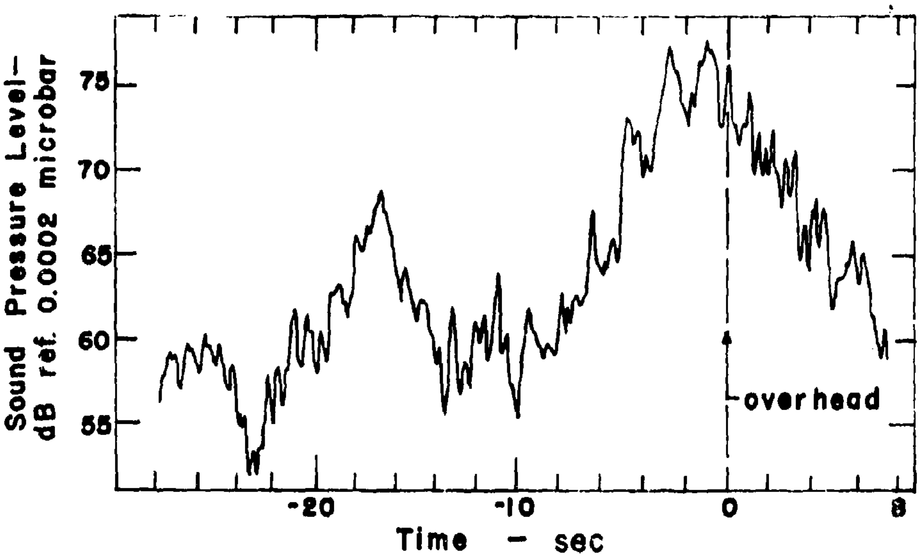


c. 63 Hz Octave

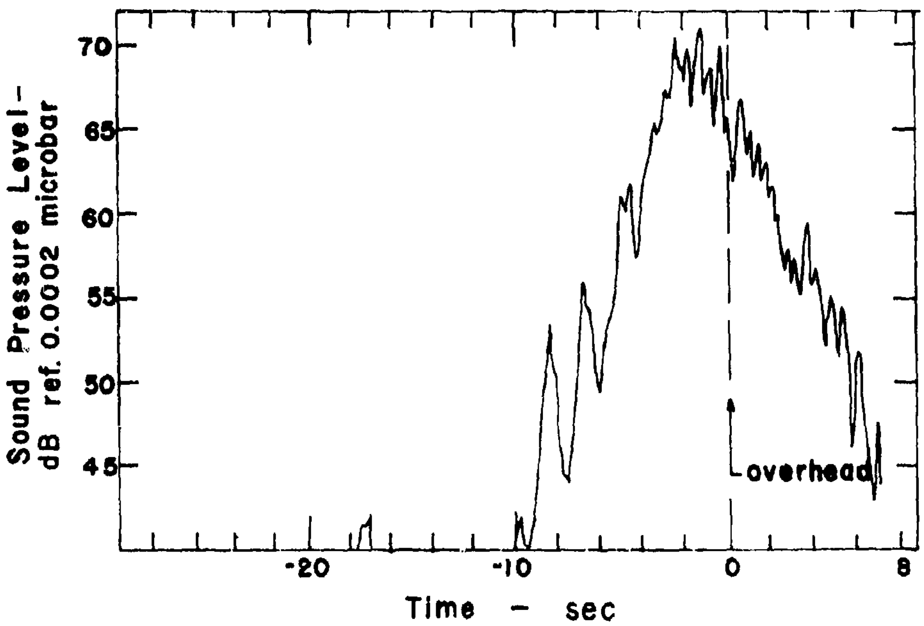


d. 125 Hz Octave

Figure 55. Continued.

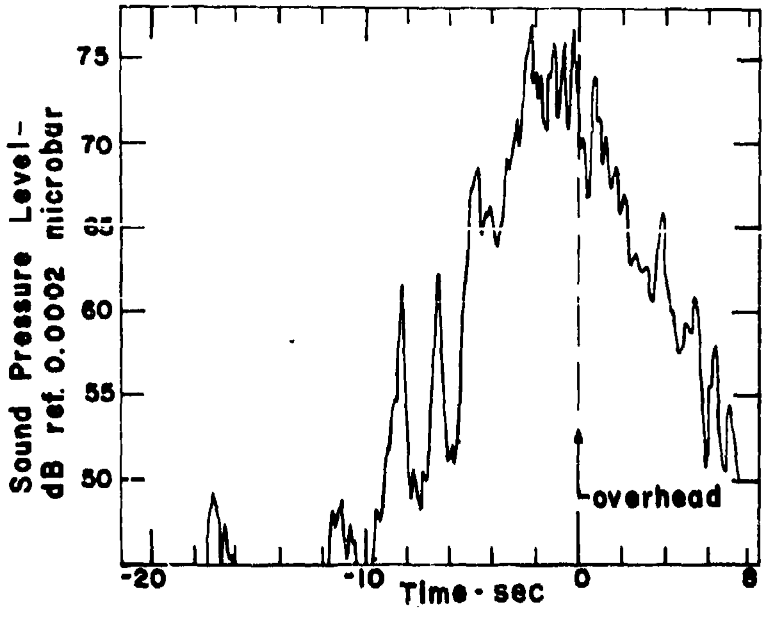


e. 250 Hz Octave

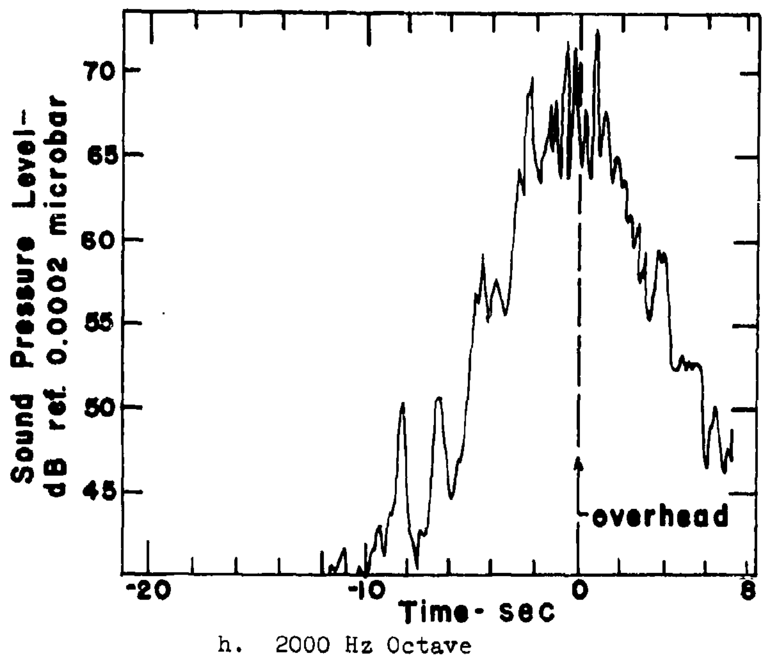


f. 500 Hz Octave

Figure 55. Continued.

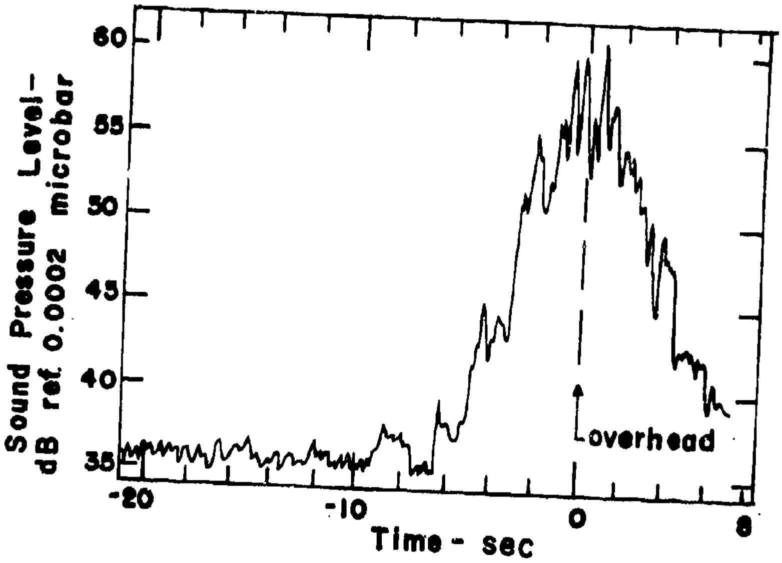


g. 1000 Hz Octave



h. 2000 Hz Octave

Figure 55. Continued.



i. 4000 Hz Octave

Figure 55. Concluded.

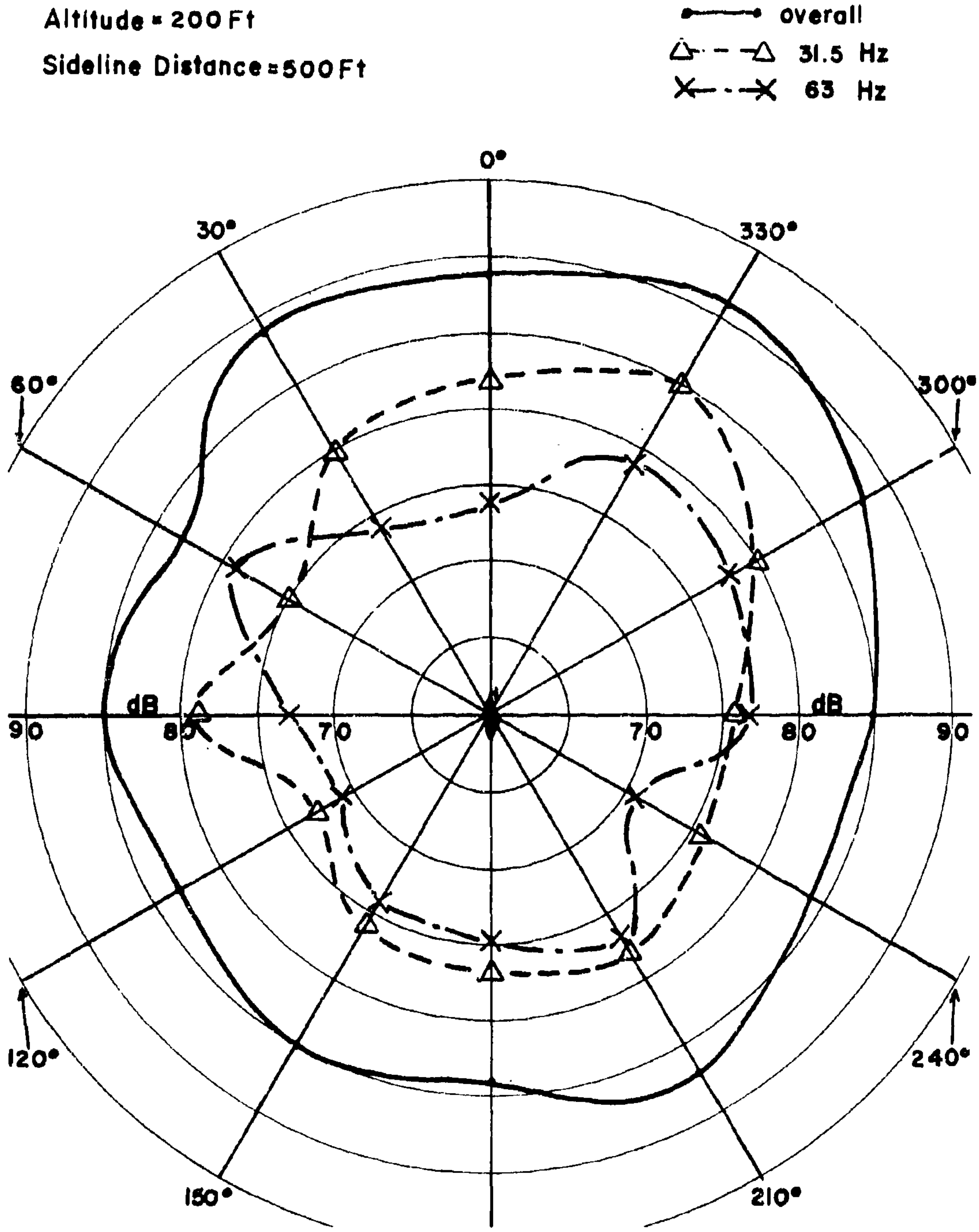


Figure 56. Octave Band Hover Noise Contours.

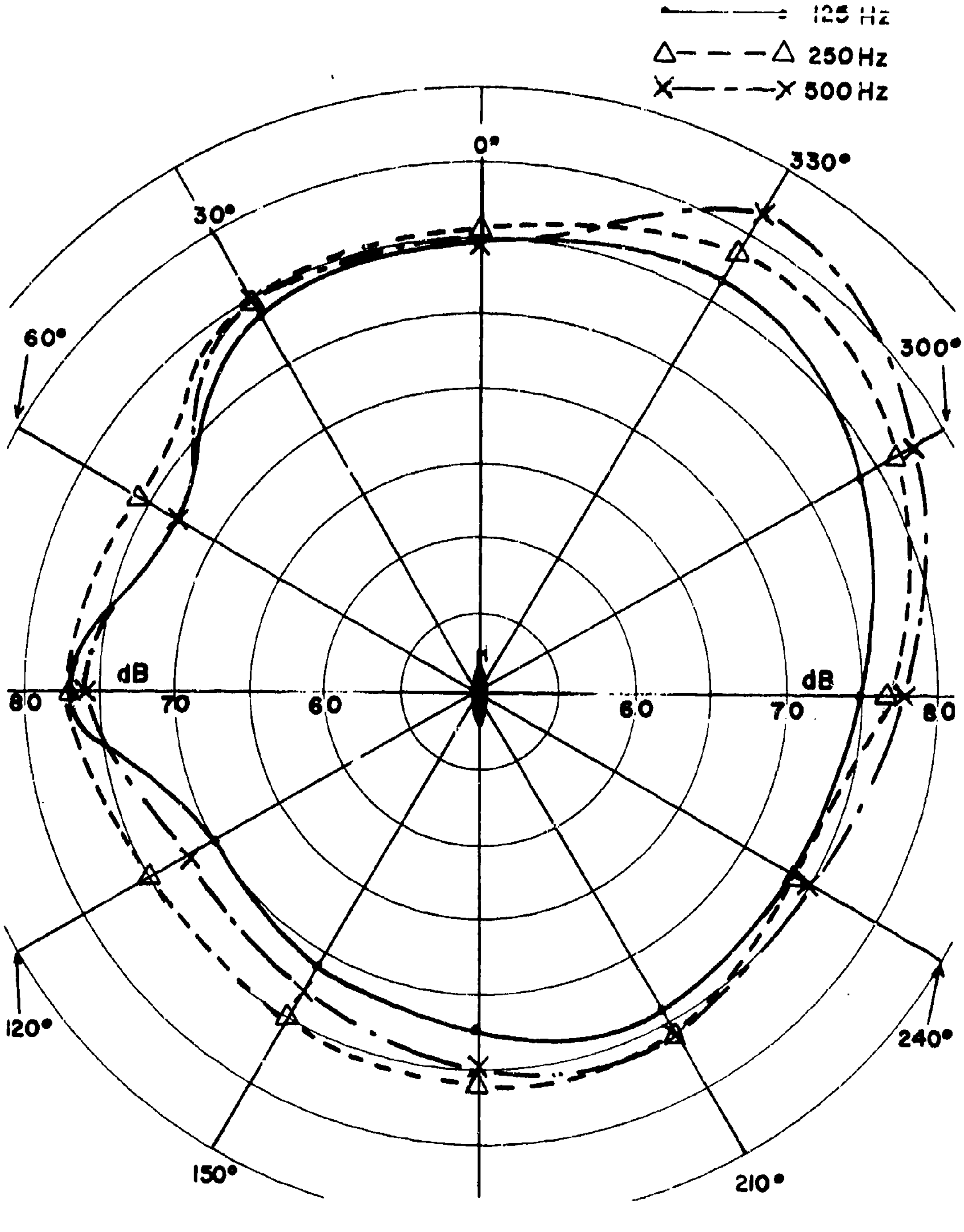


Figure 56. Continued.

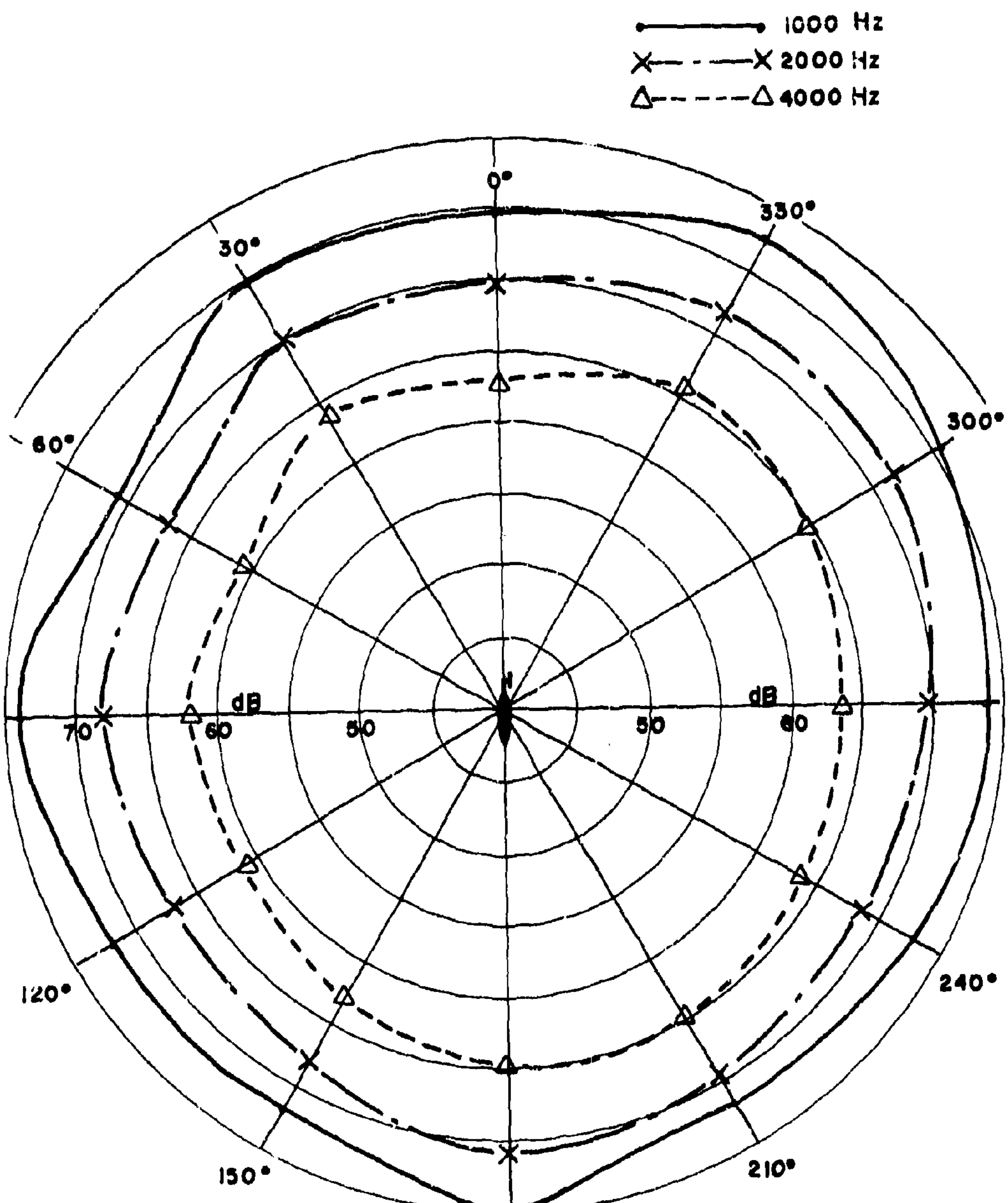


Figure 56. Concluded.

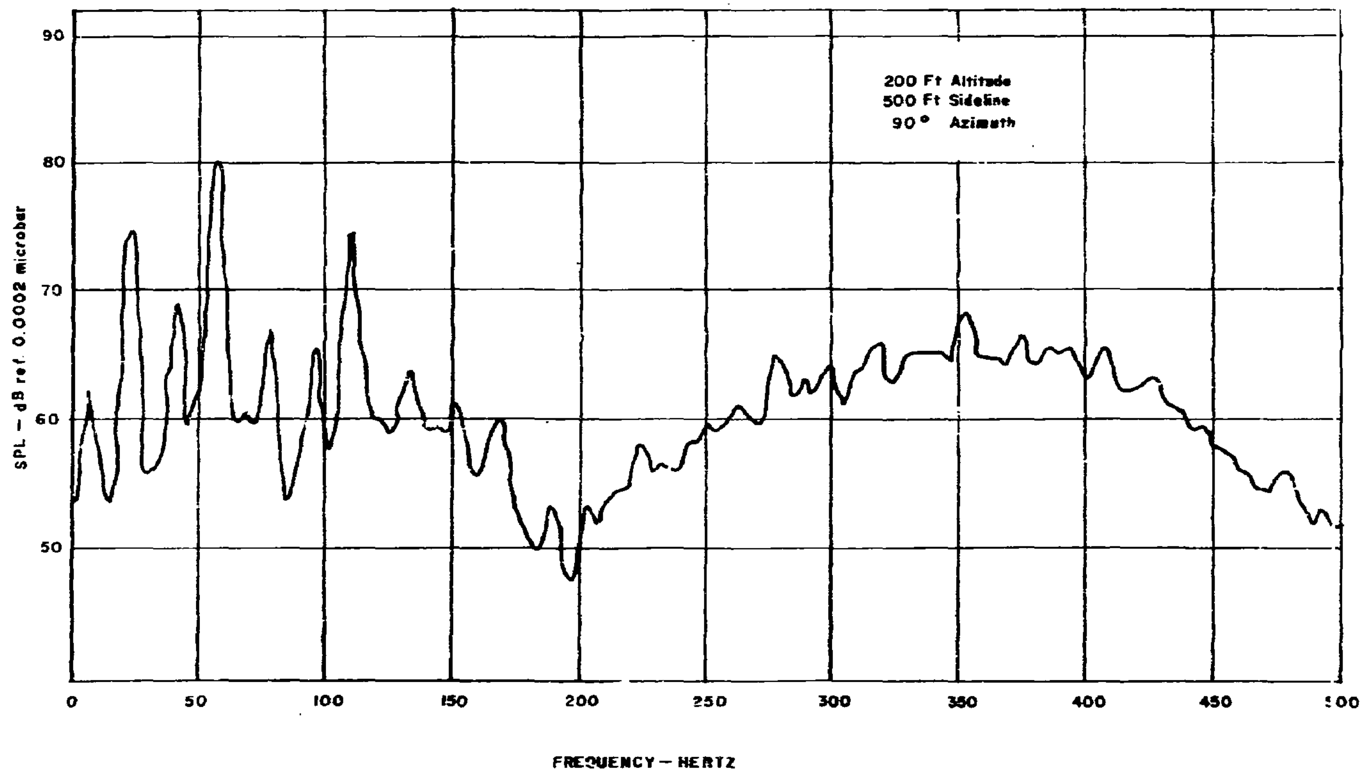


Figure 57. Narrow Bandwidth Spectrum (2.5 Hz) of CH-53A Hover Noise, No RIN.

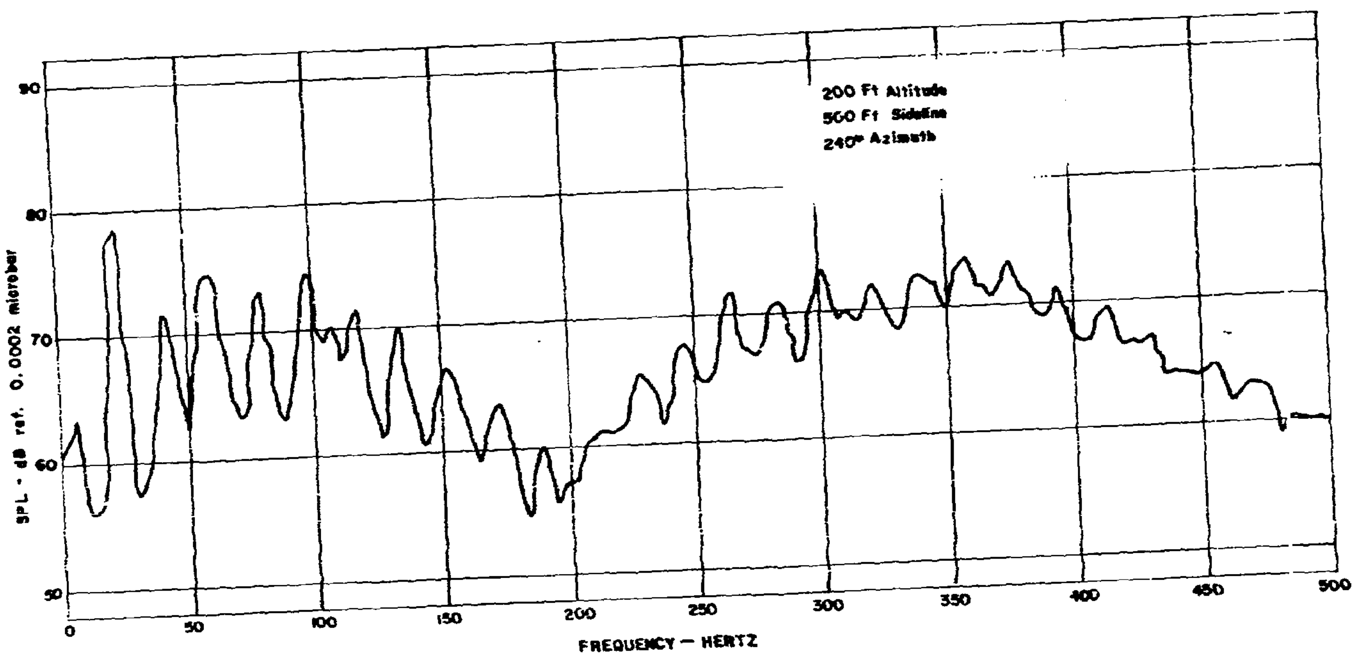


Figure 58. Narrow Bandwidth Spectrum (2.5 Hz) of CH-53A Hover Noise, RIN.

APPENDIX V

COMPUTER PROGRAM DESCRIPTION

The mechanics of a rotational noise prediction computer program are described in this appendix. Basic equations are presented in terms of engineering symbols, and names of variables used in the program are defined. User instructions, and hardware and software requirements are not repeated here since Appendix I contains this information.

V.1 Fundamental Equations

The notation of Sections I.2 through I.4 is used in the following equations. The acoustic pressure of harmonic m as a function of time is

$$P_m[t] = u_m \cos m\omega t + v_m \sin m\omega t$$

where ω is the blade passage frequency. Since acoustic data normally are root-mean-square quantities, the preceding equation is more readily used in the form

$$P_{m_{rms}} = \frac{1}{\sqrt{2}}\sqrt{u_m^2 + v_m^2}$$

which is the basis of sound pressure level of the m^{th} harmonic in decibels given by

$$SPL_m = 20 \log_{10}\left[\frac{P_{m_{rms}}}{2.9 \times 10^{-9}}\right]$$

The constant $(2.9\text{x}10^{-9})$ is the acoustic reference pressure converted from microbar units to pound per square inch units.

The following equations trace the progression from u_m and v_m values back to the starting point of differential pressure c the rotor blades.

$$u_m = \frac{1}{4\pi}\int_0^{2\pi}\int_0^{R} b\, q_1 q_2\, r\, dr\, d\psi$$

$$v_m = \frac{1}{4\pi}\int_0^{2\pi}\int_0^{R} b\, q_1 q_3\, r\, dr\, d\psi$$

The factors q_1, q_2, and q_3 are given by

$$q_1 = \left[x - r\cos\psi\right]\left\{\cos\theta\left[\sin\beta\sin\psi - \cos\beta\sin\theta\cos\psi + \sin\theta\cos\beta\cos\phi\right]\right\}$$

$$- \left[y - r\sin\psi\right]\left\{\cos\beta\sin\phi\sin\psi + \sin\beta\cos\psi\right\}$$

$$+ z\left\{\cos\theta\cos\beta\cos\phi + \sin\theta\left[\cos\beta\sin\phi\cos\psi - \sin\beta\sin\psi\right]\right\}$$

$$q_2 = g_m\left(-\frac{\cos\eta}{s^3} - \frac{m\omega}{a_0 s^2}\sin\eta\right) + h_m\left(\frac{\sin\eta}{s^3} - \frac{m\omega}{a_0 s^2}\cos\eta\right)$$

$$q_3 = g_m\left(-\frac{\sin\eta}{s^3} + \frac{m\omega}{a_0 s^2}\cos\eta\right) + h_m\left(-\frac{\cos\eta}{s^3} - \frac{m\omega}{a_0 s^2}\sin\eta\right)$$

where

$$\eta = m\omega\left(\frac{\psi}{\Omega} + \frac{s}{a_0}\right)$$

and s, the distance from a point in the rotor disk to an observer, is

$$s = \sqrt{(x - r\cos\psi)^2 + (y - r\sin\psi)^2 + z^2}$$

The final link in the progression connects the g_m and h_m terms with the differential pressure $L(r, \psi)$ acting across the blade chord at radial station r and azimuthal blade location ψ.

$$g_m = \frac{n}{\pi b}\int_{-c/2r}^{c/2r} L(r,\psi)\cos mn\psi \, d\psi$$

$$h_m = \frac{n}{\pi b}\int_{-c/2r}^{c/2r} L(r,\psi)\sin mn\psi \, d\psi$$

Here, n is the number of rotor blades, b is the maximum thickness of the blade, and c is the length of the blade chord.

The present analysis assumes that b is not a function of radius and, therefore, may be treated as a constant term in all integrations.

Important correspondences between engineering symbols and the symbols used in the programmed equations are

g_m	=	GMAR, GMARI
h_m	=	HMAR, HMARI
s	=	S
rq_1	=	Q1
q_2Q1	=	Q2

q_3^{Q1} = Q3

u_m = UMF

v_m = VMF

$P_{m_{rms}}$ = PMRMS

SPL_m = SPLM

V.2 Program Symbols

The following symbols are generated within the program and are used for the CARD or DRUM input modes (input modes are explained in Section I.5.4). Symbols used during the processing of raw data from analog tapes (TAPE input mode) are not included because the tape notation and format is unique to Sikorsky Aircraft, and inclusion of these particular symbols would not make the computer program any easier to review. Symbols for input data are described in Section I.5.4.

AZMTH(I)	Azimuth array 0 to 360 deg in 2.5-deg increments (I = 1 to 144)
AZMTH2(I)	Azimuth array 0 to 2π rad in (2.5π/180) rad increments (I = 1 to 144)
AZMTH3(I)	Azimuth array every DPRAD radians from 0 to 2π, maximum I of 288
AZRAD	2.5° expressed in radians
AZ41(I)	Azimuth points I along the chord for a given nominal azimuth
B	Blade pitch angle
BEE	Equals "B" in Hollerith used to designate bottom of blade
BLADES	Number of blades
CHORD(I)	Chord station array used in the average quadratics integration to get airloads (I = chord)
CHORD2(I)	Interpolated chord station array used in integration of g_m (ψ , R) and h_m (ψ,R)
COSINE(I)	Cosine array defined every DPSI degrees

COSRN(I)	Cosine array whose elements are calculated at each instrumented chord station and used in calculating Fourier coefficients of acoustic airloads
DATA1(I, J,K)	Scaled and corrected average pressure cycles where: I = data point, J = chord, K = radial station
DEE	Equals "D" in Hollerith used to designate differential pressure
DPRAD	$\Delta\psi$ expressed in radians
DPSI1(I)	Differential pressure array along chard, used in averaged quadratics integration
FI(I,J)	Gaussian integration factors for radial station I and chord station J
FN(I)	Temporary array used to store airloads just before harmonic analysis
GMAR(I,K)	m^{th} cosine coefficient of acoustic pressure pulse where K = radial station, I = azimuthal station
GMARI(I,K)	m^{th} cosine coefficient of acoustic pressure pulse after interpolation. I = up to 288, K = 10 or 20
GPSI(I)	Differential pressure array along a chord, used in average quadratics integration
GPSI1(I)	Array used in integration of g_m (ψ,R) and h_m (ψ,R)
GPSI2(I)	Differential pressure array along a chord, used in average quadratics integration
HARMS	Array name for pitch and flapping angle harmonics used for DRUM input mode
HMAR(I,K)	m^{th} sine coefficient of acoustic pressure pulse where K = radial station, I = azimuthal station
HMARI(I,K)	m^{th} sine coefficient of acoustic pressure pulse after interpolation. I = up to 288, K = 10 or 20

IRS(I)	Instrumented radial station counter, counting from blade root. If station bad, then IRS(I) = 0
ISI	ISI = (DPSI/2.5) $\geq$ 1; if $\leq$ 0 then ISI = 1
IX	The number of radial intervals to be used in the double integration
IY	The number of azimuthal intervals to be used in the double integration
LAZI	The number of aximuth stations as a result of interpolation. This is calculated knowing DPSI
LIRS	Number of good radial stations
NBLANK	Word with all blanks in it
NCH(I)	Total number of chord stations for radial position I
NCHAN(I,J)	Blade instrumented station designation for radial station I, chord station J. If = 0, then that station is not useable
NO	Control word used to check whether or not to execute an option
NOPTS1	Number of radial stations before interpolation (including end points .194 and 1.0) (up to 7)
NXY	Number of Gauss points and weights to be used
PI	PI = 3.14159
PI2	PI2 = 6.28318
PMRMS(I,J)	Sound pressure of harmonic I at field point J
POINT(15)	Gauss integration points (normalized)
Q1(I,J) Q2(I,J) Q3(I,J)	Functions used in a double integration, I = azimuth and J = span
S	Distance from element of rotor disk to field point
SINE(I)	Sine array defined every DPSI degrees

SINRN(I)	Sine array calculated for each instrumented chord station and used in Fourier analysis of acoustic airloads
SPAN(L)	Radial stations used in a double integration, L = 1 to 20
SPLM(I,J)	Sound pressure level of harmonic I at field point J
TEE	Equals "T" in Hollerith used to designate top of blade
TEM1(I) TEM2(I)	Temporary arrays used in Fourier analysis subroutine arguments
TEMP1(I) TEMP2(I) TEMP3(I)	Temporary work arrays used in the interpolation of GMAR and HMAR
UMF(I,J) VMF(I,J)	Components of sound pressure, I = harmonic order, J = field point number
W(I)	Temporary work array, I = 1,14
WPOINT(I)	Gauss integration weights, I = 1,15
XLM(I,J)	Cosine component of section loading harmonic J at radial station I
XMM(I,J)	Sine component of section loading harmonic J at radial station I
XLO(I)	Steady component of section loading at radial station I
XO(I)	Array used in interpolation routine
YES	Control word used to check whether or not to execute an option
YO(I)	Array used in interpolation routine

V.3 Program Logic and Subroutine Names

The general flow of operations in the program is as follows for the CARD input mode.

1. Accept harmonics of differential pressure from cards. Sum these harmonics to produce the differential pressure at each span and chord station every DPSI degrees of azimuth.

2. If output from E386 is desired, calculate the blade section loading (airload, pounds per inch of span) by integrating the differential pressures across the chord at each span station. A trapezoidal integration routine is used. If E386 is not desired, skip to Step 4.

3. Proceed through E386.

4. If noise levels based on the actual chordwise pressure distribution are required, interpolate to provide 41 points along the blade chord. These points are required to define the Fourier coefficients of the pulse shape (chordwise pressure distribution). If noise based on the actual chordwise distribution is not desired, skip to Step 12.

5. Calculate GMAR and HMAR for a particular noise harmonic and store them on magnetic tape via I/O unit 14.

6. Interpolate GMAR and HMAR if 288 azimuthal and/or 20 radial points are desired. This interpolation produces GMARI and HMARI.

7. Calculate Q arrays for the first field point.

8. Calculate UMF and VMF components of acoustic pressure for the first field point.

9. Calculate SPLM for the first field point.

10. Repeat steps 7, 8, and 9 for the rest of the field points (field point loop).

11. Repeat steps 5 through 10 for the rest of the noise harmonics (harmonic loop).

12. Repeat steps 1 through 11 for the remaining flight conditions or "data bursts" (burst loop).

Steps 1 through 5 are omitted when the DRUM input mode is used. The GMAR and HMAR coefficients stored on tape are read into the memory of the computer, and calculations begin with the interpolation to produce GMARI and HMARI.

Subroutines called by the main program, E676, are listed below. System subroutines, such as COS, SIN, ALOG10, NTRAN, etc., are not mentioned. Sequence codes are explained in Section V.4.

AVQUAD	Performs integration by averaged quadratics based on Lagrange interpolation; sequence code is L76A.
BLODAT	BLOCK DATA subroutine; sequence code is L76B.
CUBIC	Subroutine used by CURVIT; sequence code is L76F.

CUE	Calculates an array (Q1, Q2,Q3) which is a function of azimuth, radius and observer location. A double integration of this variable yields the sound pressure components u_m and v_m; sequence code is L76C.
CURVIT	Cubic interpolation subroutine; sequence code is L76V.
DFSRIE	Computes the coefficients of a Fourier series; sequence code is L76D.
E386RN	Calculates SPL based on a rectangular chordwise distribution of pressure; sequence code is L76E.
INPUTA	Reads and prints out card input; sequence code is L76I.
INTERP	Linearly interpolates pressure pulse harmonics up to 20 blade span stations and 288 azimuths; sequence code is L76P.
OUTSPL	Output subroutine; sequence code is L76O.
PARAM	Subroutine used by CURVIT: sequence code is L76X.
SIMCOR	Simpson's integration boutine; sequence code is L76S.
TRIDAG	Subroutine used by CURVIT; sequence code is L76T.

The next three subroutines are used to process aerodynamic data contained on digital tape.

MERGES	Combines the absolute pressure of the instrumented top and bottom blade stations, to produce only differential pressures for all blade stations; sequence code is L76G.
RDKU	Reads in one record from the proper input tape, where two records make up one azimuthal pressure cycle; sequence code is L76R.
UNPACK	Unpacks an array containing tape information (two records) into separate arrays representing azimuthal pressure cycles for each pressure transducer channel; sequence code is L76U.

V.4 Program Listing

Figures 59 and 60 contain a listing of the source deck of the computer program. The last 8 columns of the 80-column cards have been used to sequence the deck. The first 4 characters of a sequence number identify a

statement with a specific subroutine or with the main program, and the last 4 characters locate the statement serially within the appropriate area of the program. Symbols are defined in Sections I.5.4 and V.2.

```
BI  FOR  E676
C ROTOR NOISE PROGRAM FOR W. BAUSCH BY G. CAMPE.
      COMMON /BK1/ IDD,BB,AA,XA(5,5),DPSI,RR(5),OMEG,CC,NBLADE,MLIMRN,
     * MLIMDP,XFP(20),YFP(20),ZFP(20),GAMA,RO,BLADEL,BO,B1C,B1S,PUNCH,
     * LSPAN,FROC(30),TCOP,SLOPE(10,5),OFFSET(10,5),KUNIT(5),IBURST,
     * IRS(5),ITRACK(5),F1(5,5),NCHAN(5,5),E3860P,NFT,ANG,KEY1,KEY2,
     * KEY3,NHH,CAPRF(20),THETAF(20),ALFAF(20),OPRONO,NCH(5),INTERM,
     * IREEL,NC,NTBOX(5,10),NSTATC(5,10),NSTATR(5,10),ISET(5),IREELS,
     * NOCH(5),LAZI
      COMMON /BK2/ NCYCLE,CYCLES,KU,NDIV(4),BMASK(6),NN(435),LIRS,
     * KTRACK,KBURST,KREC,ND1(144,10,5),ND2(144,10,5),XLM(7),XLM(7,40),
     * XMM(7,40),TEMP1(7),TEMP2(7),TEMP3(7),PI,AZMTH2(144),AZMTH(144),
     * DPRAD,AZRAD,NO,YES,NBLANK,TEE,DEE,DEE,GMARI(288,20),
     * HMARI(288,20),XO(20)
      COMMON /BK3/ SPLM(10,20),AZMTH3(288),
     * SPAN(20),                        PMRMS(10,20),
     * ICHANL(10,5),COSINE(288),SINE(288),BLADES,CARD,TAPE
      INTEGER TCOP,CARD,TAPE,E3860P,OPRONO,YES
      DIMENSION ID(10)
      DATA ID/'H1','H2','H3','H4','H5','H6','H7','H8','H9','H10'/
      COMMON /TEMPUS/ TIME,COUNT
      DIMENSION DATA1(144,10,5),DATA2(144,10,5),FN(144),CHORD(7),
     * GPSI(7),GPSI1(7),TEM1(30),TEM2(30),CHORD2(41),GPSI2(41),GPSI3(41)
     *,COSRN(41),SINRN(41)
      EQUIVALENCE (ND1,DATA1),(ND2,DATA2),(NN,FN),(TEMP1,CHORD),
     * (TEMP2,GPSI),(TEMP3,GPSI1)
      DIMENSION CN(31,5,5),SN(30,5,5),AN(31,10,5),BN(30,10,5),
     * GMAR(144,5),HMAR(144,5)
     * ,Q1(288,20),Q2(288,20)
      EQUIVALENCE    (ND2(5761),HMAR),
     $               (GMARI,AN),
     * (GMARI(1551),BN),(HMARI,CN),(HMARI(776),SN),(ND2,Q2)
      EQUIVALENCE (ND1(5761),GMAR),(ND1,Q1)
      DIMENSION AZ41(41)
      DIMENSION DBI(289)
      EQUIVALENCE (DBI,SINE)
      COMMON /NEW/ FO,F1C,F1S,TOTIME,THETA
      DIMENSION XU(10,20),XV(10,20),P(41),COSARG(41,20),SINARG(41,20)
      DIMENSION HARMS(6),BHARM(3),FHARM(3)
      EQUIVALENCE (BO,BHARM),(FO,FHARM)
      NTIME=41
      MSTART=1
      CALL INPUTA
      IF(TCOP.NE.TAPE) GO TO 199
      REWIND 8
      REWIND 9
      REWIND 10
      REWIND 11
      REWIND 12
      REWIND 13
  199 LIRS = 0
      PI = 3.14159265
      DO 1 I=1,5
      IF(IRS(I).NE.0) LIRS = LIRS+1
    1 CONTINUE
      DPRAD = DPSI*6.28318531/360.
      AZRAD = (2.5*PI)/180.
      AZMTH(1) = 0.
      AZMTH2(1) = 0.
      DO 2 I=2,144
      AZMTH2(I) = AZMTH2(I-1)+AZRAD
    2 AZMTH(I)  = AZMTH(I-1)+2.5
      PI2 = 6.283185
      AZMTH3(1)=0.
      COSINE(1)=1.
```

Figure 59. Main Program E676.

```
      SINE(1)=0.                                                        L76M0650
      T1=(PI2/DPRAD)+.001                                               L76M0660
      J=T1                                                              L76M0670
      IF(J.LE.288) GO TO 211                                            L76M0680
      WRITE(6,212)                                                      L76M0690
  212 FORMAT(1H1, 63HTHE DIMENSION OF AZMTH3 HAS BEEN EXCEEDED AT STATEML76M0700
    *ENT NO. 211      )                                                 L76M0710
      WRITE(6,35) (AZMTH3(L),L=1,288)                                   L76M0720
      WRITE(6,35)PI2                                                    L76M
      STOP                                                              L76M0730
  211 DO 4 LAZI=2,J                                                     L76M0740
      AZMTH3(LAZI) = AZMTH3(LAZI-1)+DPRAD                               L76M0750
      COSINE(LAZI) = COS(AZMTH3(LAZI))                                  L76M0760
    4 SINE(LAZI)   = SIN(AZMTH3(LAZI))                                  L76M0770
      IF(IDD.NE.1) GO TO 210                                            L76M0780
      WRITE(6,213)                                                      L76M0790
  213 FORMAT(1H1,11HAZMTH3(288))                                        L76M0800
      WRITE(6,35) (AZMTH3(L),L=1,288)                                   L76M0810
  210 BLADES = NBLADE                                                   L76M0820
      T1 = 1./41.                                                       L76M0830
      CHORD2(1) = 0.                                                    L76M0840
      DO 6 L=2,40                                                       L76M0850
    6 CHORD2(L) = CHORD2(L-1) + T1                                      L76M0855
C                                                                       L76M0860
C *** A LONG LOOP ON BURSTS IS NEXT.                                    L76M0870
    7 IF(IDD.NE.1) GO TO 9300                                           L76M0880
      CALL START                                                        L76M0890
 9300 IF(TCOP.EQ.CARD) GO TO 10                                         L76M0900
C                                                                       L76M0907
C  CARD  L76M0910  BRANCHES TO STATEMENT 57  IF DRUM INPUT REQUESTED    L76M0908
C                                                                       L76M0909
C     IF (TCOP .EQ. 'DRUM')  GO TO 57                                   L76M0910
      READ(5,8) IBURST                                                  L76M0920
C GET START OF BURST TIME                                               L76M0930
    8 FORMAT( 11X,I3 )                                                  L76M0940
C                                                                       L76M0950
C *** A CHOISE I MADE NEXT (OPTION) TO EITHER  ACEPT TAPE OR CARD INPUT.L76M0960
      DO 9 I=1,144                                                      L76M0970
      DO 9 J=1,10                                                       L76M0980
      DO 9 K=1,5                                                        L76M0990
    9 ND2(I,J,K) = 0                                                    L76M1000
C                                                                       L76M1010
C *** LOOP ON TAPE REELS FOLLOWS.                                       L76M1020
      DO 11 IREEL=1,IREELS                                              L76M1030
      KU = KUNIT(IREEL)                                                 L76M1040
      IF(IDD.EQ.1)                                                      L76M1050
     XWRITE(6,231) IREEL,KU                                             L76M1060
   12 CALL RDKU(1)                                                      L76M1070
      IF(IBURST.NE.KBURST) GO TO 12                                     L76M1080
      IF(IDD.EQ.1)                                                      L76M1090
     XWRITE(6,231) IREEL,KU,KREC,KBURST,KTRACK                          L76M1100
      GO TO (13,13,13,13,13,13,13,13,14,15,16,17),KU                    L76M1110
   13 BACKSPACE 8                                                       L76M1120
      GO TO 18                                                          L76M1130
   14 BACKSPACE 9                                                       L76M1140
      GO TO 18                                                          L76M1150
   15 BACKSPACE 10                                                      L76M1160
      GO TO 18                                                          L76M1170
   16 BACKSPACE 11                                                      L76M1180
      GO TO 18                                                          L76M1190
   17 BACKSPACE 12                                                      L76M1200
      BACKSPACE 13                                                      L76M1210
   18 NCYCLE = 0                                                        L76M1220
C *** THE FIRST CYCLE IN BURST IBURST IS READ.                          L76M1230
      CALL RDKU(1)                                                      L76M1240
      CALL RDKU(2)                                                      L76M1250
```

Figure 59. Continued.

```
      KB = KBURST
      GO TO 19
C *** THE REMAINING CYCLES IN BURST IBURST ARE READ AND AVERAGED.
   20 CALL RDKU(1)
      IF(KBURST.NE.KB) GO TO 21
      CALL RDKU(2)
      IF(KBURST.NE.KB) GO TO 21
C
C *** SUBR. UNPACK UNPACKS NN(435) TO FORM ND1(I,J,K) WHERE I=DATA POINT
C *** J=CHANNEL, K=REEL NO.
   19 CALL UNPACK
      NCYCLE = NCYCLE+1
C *** CHANNEL LOOP
      K = NOCH(IREEL)
      DO 22 J=1,K
      NC = ICHANL(J,IREEL)
      IF(IDD-1) 234,236,234
  236 IF(IREEL-1) 234,235,234
  235 IF(IDD.EQ.1)                    WRITE(6,231) NCYCLE,K,NC,ND1(1,NC,IREEL
     X L)
  234 CONTINUE
  231 FORMAT(4I13)
      DO 22 I=1,144
      ND2(I,NC,IREEL) = ND2(I,NC,IREEL) + ND1(I,NC,IREEL)
   22 CONTINUE
      GO TO 20
C *** AT THIS POINT THE END OF BURST HAS BEEN REACHED.
   21 GO TO (23,23,23,23,23,23,23,23,24,25,26,27),KU
   23 BACKSPACE 8
      GO TO 28
   24 BACKSPACE 9
      GO TO 28
   25 BACKSPACE 10
      GO TO 28
   26 BACKSPACE 11
      GO TO 28
   27 BACKSPACE 12
      BACKSPACE 13
   28 CYCLES = NCYCLE
C *** THE AVERAGE CYCLES ARE FOUND NEXT.
      K = NOCH(IREEL)
      DO 29 J=1,K
      NC = ICHANL(J,IREEL)
      DO 29 I=1,144
      T1 = ND2(I,NC,IREEL)
   29 DATA2(I,NC,IREEL) = T1/CYCLES
   11 CONTINUE
C *** FILTER ROLL OFF CORRECTION AND TAPE DATA SCALING FOLLOWS.
      DO 30 IREEL=1,IREELS
      K = NOCH(IREEL)
      DO 30 J=1,K
      NC = ICHANL(J,IREEL)
      DO 31 I=1,144
   31 FN(I) = DATA2(I,NC,IREEL)
      CALL OFSRIE (144,MLIMDP,FN,TEM1,TEM2)
      AN(1,NC,IREEL) = TEM1(1)
      DO 32 I=1,MLIMDP
      AN(I+1,NC,IREEL) = TEM1(I+1)
   32 BN(I,NC,IREEL) = TEM2(I+1)
      IF(IDD.NE.1) GO TO 30
      WRITE(6,33) IREEL,NC,(FN(NAZ),NAZ=1,144)
   33 FORMAT(1H0, 5HREEL=,I3, 7X, 8HCHANNEL=, I3, 7X, 35HAVE. CYCLE AND
     1ITS HARMONICS FOLLOW // (2X,1PE10.3,12E10.3) )
      I=MLIMDP+1
      WRITE(6,34) (AN(L,NC,IREEL),L=1,I)
      WRITE(6,35) (BN(L,NC,IREEL),L=1,MLIMDP)
```

Figure 59. Continued.

```
   34 FORMAT(1H0,1X,1PE10.3 / (2X,13E10.3))
   35 FORMAT( /  (2X,1PE10.3,12E10.3))
   30 CONTINUE
      DO 36 IREEL=1,IREELS
      IF(IOD.EQ.1) WRITE(6,40) IREEL
   40 FORMAT(1H0,10HREEL NO. =,I3,10X, 77HAVE. PRESSURE CYCLE HARMONICS
     X(CORRECTED FOR FILTER ROLL-OFF AND ENGR. UNITS)  )
      K=NOCH(IREEL)
      DO 36 J=1,K
      NC = ICHANL(J,IREEL)
      AN(1,NC,IREEL) = AN(1,NC,IREEL)*SLOPE(NC,IREEL)+OFFSET(NC,IREEL)
      DO 37 I=1,MLIMDP
      T1 = FROC(I)*SLOPE(NC,IREEL)
      AN(I+1,NC,IREEL) = AN(I+1,NC,IREEL)*T1
   37 BN(I,NC,IREEL) = BN(I,NC,IREEL)*T1
      IF(IOD.NE.1) GO TO 36
      WRITE(6,38)  NC,AN(1,NC,IREEL),(AN(I+1,NC,IREEL),I=1,MLIMDP)
   38 FORMAT(1X,  8HCHANNEL=,I3,5X, 11(1PE10.3) /  (27X,10E10.3 / ) )
      WRITE(6,39) (BN(I,NC,IREEL),I=1,MLIMDP)
   39 FORMAT( 27X,10(1PE10.3) / (27X,10E10.3) )
   36 CONTINUE
C *** THE FOLLOWING SUBR. COMBINES THE TOP AND BOTTOM ABSOLUTE PRESSURE
C    COEFFICIENT
C     TO PRODUCE DIFFERENTIAL PRESS. COEFF.  CN(31,5,5), SN(30,5,5)WHERE
C     FIRST SUBS. = HARMONIC, SECOND SUBS. = CHORD, THIRD SUBS. = SPAN.
C     BLADE PITCH HARMONICS, B0,B1C,B1S  ARE ALSO CALCULATED.
      CALL MERGES
      IF(IOD.NE.1) GO TO 240
      DO 239 I=1,5
      DO 239 J=1,5
      WRITE(6,47) CN(1,J,I)
      WRITE(6,47) (CN(K+1,J,I),K=1,MLIMDP)
  239 WRITE(6,47) (SN(K,J,I),K=1,MLIMDP)
C *** NOW THE DIFFERENTIAL PRESSURE FOURIER COEFFICIENTS OF THE AVERAGE
C      CYCLES IS PUNCHED OUT.
C      CYCLES IS PUNCHED OUT.
      IF(PUNCH.NE.YES) GO TO 41
  240 WRITE(7,42) IBURST
   42 FORMAT( 11HBURST NO. =,I3,11X, 34H*** ROTOR NOISE PUNCHED OUTPUT *
     X**)
      WRITE (7,43) B0,B1C,B1S,F0,F1C,F1S
   43 FORMAT('BLADE PITCH HARMONICS'/1P3E10.4,2X'(COLLECTIVE, LONGITUDIN
     $AL, LATERAL RESPECTIVELY)'/'ROTOR FLAPPING ANGLE HARMONICS'/1P3E10
     $.4,2X'(POSITIVE TAIL HIGH -- DEGREES)')
      WRITE (7,431)
  431 FORMAT(                             'DIFFERENTIAL PRESSURE HARMO
     $NICS FOR 5 CHORD STATIONS AT EACH OF THE 5 SPANS'/'(MEASURING FROM
     $ THE LEADING EDGE AND THE BLADE ROOT RESPECTIVELY).' )
C *** SPAN LOOP
      DO 44 I=1,5
C *** CHORD LOOP
      DO 44 J=1,5
      WRITE(7,49) I,J,CN(1,J,I)
   49 FORMAT( 4HSPAN,I2,2X, 5HCHORD,I2,7X, 8HSTEADY= , 1PE10.4 )
      WRITE(7,45)
   45 FORMAT( 19HCOSINE COEFFICIENTS )
   47 FORMAT(  8(1PE10.4) )
      WRITE(7,47) (CN(K+1,J,I),K=1,MLIMDP)
      WRITE(7,48)
   48 FORMAT( 17HSINE COEFFICIENTS )
   44 WRITE(7,47) (SN(K,J,I),K=1,MLIMDP)
      GO TO 41
C *** CARD INPUT (INSTEAD OF TAPE INPUT) IS ACCEPTED NEXT.
   10 READ(5,42) IBURST
      READ (5,43) B0,B1C,B1S,F0,F1C,F1S
      READ (5,431)
```

Figure 59. Continued.

```
C *** SPAN LOOP                                                              L76M2580   00264
      DO 50 I=1,5                                                            L76M2590   00265
C *** CHORD LOOP                                                             L76M2600   00266
      DO 50 J=1,5                                                            L76M2610   00267
      READ(5,49) IN,JN,CN(1,JN,IN)                                           L76M2620   00268
      READ(5,45)                                                             L76M2630   00269
      READ(5,47) (CN(K+1,J,I),K=1,MLIMOP)                                    L76M2640   00270
      READ(5,48)                                                             L76M2650   00271
   50 READ(5,47) (SN(K,J,I),K=1,MLIMOP)                                      L76M2660   00272
C *** AVERAGE DIFFERENTIAL PRESSURE CYCLES FOR SPAN I CHORD J AZIMUTH K L76M2670   00273
C     FOUND BY SUMMING THE CORRECTED HARMONICS.                              L76M2680   00274
C *** SPAN LOOP                                                              L76M2690   00275
C AT THIS POINT THE PRESSURE INPUT HAS BEEN ACCEPTED (TAPE OR CARD INPUTL76M2700   00276
   41 CONTINUE                                                               L76M2710   00277
      DO 120 I=1,3                                                           L76M2720   00278
      HARMS(I)=BHARM(I)                                                      L76M2730   00279
  120 HARMS(I+3)=FHARM(I)                                                    L76M2740   00280
C                                                                            L76M2747   00281
C  CARD  L76M2750  STORES  BLADE  ANGLE  HARMONICS  ON  DRUM                 L76M2748   00282
C                                                                            L76M2749   00283
C     CALL DATCUR ('HARMS',0,14,HARMS,6)                                     L76M2750   00284
      IF(IDD.NE.1) GO TO 9301                                                L76M2760   00285
      CALL CLOCK                                                             L76M2770   00286
 9301 DO 51 I=1,5                                                            L76M2780   00287
C *** CHORD LOOP                                                             L76M2790   00288
      DO 51 J=1,5                                                            L76M2800   00289
      T1 = -AZRAD                                                            L76M2810   00290
C *** AZIMUTH (POINT) LOOP                                                   L76M2820   00291
      DO 51 K=1,144                                                          L76M2830   00292
      DATA1(K,J,I) = CN(1,J,I)                                               L76M2840   00293
      T1 = T1+AZRAD                                                          L76M2850   00294
      T3 = 0.                                                                L76M2860   00295
C *** HARMONIC LOOP                                                          L76M2870   00296
      DO 51 L=1,MLIMOP                                                       L76M2880   00297
      T3 = T3+1.                                                             L76M2890   00298
      T2 = T1*T3                                                             L76M2900   00299
   51 DATA1(K,J,I) = DATA1(K,J,I)+CN(L+1,J,I)*COS(T2)+SN(L,J,I)*SIN(T2) L76M2910   00300
      WRITE(6,54)                                                            L76M2920   00301
   54 FORMAT(1H1,59HDIFFERENTIAL PRESSURE CYCLES AT INSTRUMENTED BLADE SL76M2930   00302
     XTATIONS // )                                                           L76M2940   00303
      DO 53 I=1,5                                                            L76M2950   00304
      DO 53 J=1,5                                                            L76M2960   00305
      WRITE(6,55) I,J                                                        L76M2970   00306
   55 FORMAT(1H0, 12HSPAN STATION,I3,5X,13HCHORD STATION, I3//)              L76M2980   00307
   53 WRITE(6,56) (DATA1(K,J,I),K=1,144)                                     L76M2990   00308
   56 FORMAT( 2X,10(1PE13.4) )                                               L76M3000   00309
C *** THE FOLLOWING INPUT OPTION DESIDES WHETHER OR NOT TO CALL THE ACOUL76M3010   00310
C     STICS PROGRAM E386 WHICH IS A SIMPLIFIED VERSION OF THIS PROGRAM. L76M3020   00311
   52 IF(E386OP.NE.YES) GO TO 57                                             L76M3030   00312
      KK = 1                                                                 L76M3040   00313
      XLO(1) = 0.                                                            L76M3050   00314
      DO 9501 J=1,NHH                                                        L76M3060   00315
      XLM(1,KK) = 0.                                                         L76M3070   00316
 9501 XMM(1,KK) = 0.                                                         L76M3080   00317
C *** RADIAL STATION LOOP                                                    L76M3090   00318
      DO 58 I=1,5                                                            L76M3100   00319
      KK = KK+1                                                              L76M3110   00320
      IF(IRS(I).EQ.0) GO TO 58                                               L76M3120   00321
      IF(NCH(I).EQ.5) GO TO 59                                               L76M3130   00322
      NT1 = NCH(I)+2                                                         L76M3140   00323
      K=1                                                                    L76M3150   00324
      CHORD(1) = 0.                                                          L76M3160   00325
      DO 60 L=1,5                                                            L76M3170   00326
      IF(NCHAN(I,L).EQ.0) GO TO 60                                           L76M3180   00327
      K=K+1                                                                  L76M3190   00328
      CHORD(K)=XA(L,I)                                                       L76M3200   00329
```

Figure 59. Continued.

```
   60 CONTINUE                                                        L76M3210  00330
      CHORD(K+1)=1.                                                   L76M3220  00331
      GPSI(1)=0,                                                      L76M3230  00332
      DO 61 J=1,144                                                   L76M3240  00333
      K=1                                                             L76M3250  00334
      DO 62 L=1,5                                                     L76M3260  00335
      IF(MCHAN(1,L).EQ.0) GO TO 62                                    L76M3270  00336
      K=K+1                                                           L76M3280  00337
      GPSI(K) = DATA1(J,L,I)                                          L76M3290  00338
   62 CONTINUE                                                        L76M3300  00339
      GPSI(K+1) = 0.                                                  L76M3310  00340
      CALL AVQUAD(NT1,CHORD,GPSI,AREA)                                L76M3320  00341
   61 FN(J) = AREA*AA                                                 L76M3330  00342
      GO TO 63                                                        L76M3340  00343
   59 DO 64 J=1,144                                                   L76M3350  00344
      FN(J) = 0.                                                      L76M3360  00345
      DO 65 L=1,5                                                     L76M3370  00346
   65 FN(J) = FN(J)+DATA1(J,L,I)*FI(I,L)                              L76M3380  00347
   64 FN(J) = FN(J)*AA                                                L76M3390  00348
   63 CALL DFSRIE(144,NHH,FN,TEM1,TEM2)                               L76M3400  00349
      XLO(KK) = TEM1(1)                                               L76M3410  00350
      DO 66 J=1,NHH                                                   L76M3420  00351
      XLM(KK,J) = TEM1(J+1)                                           L76M3430  00352
   66 XMM(KK,J) = TEM2(J+1)                                           L76M3440  00353
   58 CONTINUE                                                        L76M3450  00354
      KK = KK+1                                                       L76M3460  00355
      XLO(KK) = 0.                                                    L76M3470  00356
      DO 9500 J=1,NHH                                                 L76M3480  00357
      XLM(KK,J) = 0.                                                  L76M3490  00358
 9500 XMM(KK,J) = 0.                                                  L76M3500  00359
      WRITE(6,201)                                                    L76M3510  00360
  201 FORMAT(1H1, 11HXLO XLM XMM ,///)                                L76M3520  00361
      DO 202 KK=1,7                                                   L76M3530  00362
      WRITE(6,203) XLO(KK),(XLM(KK,J),J=1,NHH),(XMM(KK,J),J=1,NHH)    L76M3540  00363
  220 FORMAT(//(1PE13.5))                                             L76M3550  00364
  203 FORMAT(F8.2/(10F8.2))                                           L76M3560  00365
  202 CONTINUE                                                        L76M3570  00366
  200 CALL E386RN                                                     L76M3580  00367
   57 IF(OPRONO.NE.YES) GO TO 7                                       L76M3590  00368
C                                                                     L76M3597  00369
C  CARDS  L76M3600  THRU  L76M3640  READ PRESSURES FROM DRUM          L76M3598  00370
C                                                                     L76M3599  00371
C     IF (TCOP .NE. 'DRUM')  GO TO 122                                L76M3600  00372
C     CALL PCFDRD ('HARMS',0,HARMS,6)                                 L76M3610  00373
C     DO 121 I=1,3                                                    L76M3620  00374
C     BHARM(I) = HARMS(I)                                             L76M3630  00375
C 121 FHARM(I) = HARMS(I+3)                                           L76M3640  00376
  122 CONTINUE                                                        L76M3650  00377
C BEGINNING OF ROTOR NOISE ANALYSIS                                   L76M3660  00378
      IF(IDD.NE.1) GO TO 9302                                         L76M3670  00379
      CALL START                                                      L76M3680  00380
 9302 T1 = LSPAN-1                                                    L76M3690  00381
      T1 = (0.7695 * BLADEL)/T1                                       L76M3700  00382
      SPAN(1) = 99.9                                                  L76M3710  00383
      DELSPN = 0.5*T1                                                 L76M3720  00384
      DO 67 L=2,LSPAN                                                 L76M3730  00385
   67 SPAN(L) = SPAN(L-1)+T1                                          L76M3740  00386
      L=MSTART-1                                                      L76M3750  00387
      FM=L                                                            L76M3760  00388
      T4 = BLADES/(PI*BB)                                             L76M3770  00389
      DIMENSION RSO(18)                                               L76M3780  00390
      REWIND 28                                                       L76M3790  00391
      IF(IDD.NE.1) GO TO 9103                                         L76M3800  00392
      GC2=SPAN(1)+DELSPN                                              L76M3810  00393
      J=LSPAN-2                                                       L76M3820  00394
      DO 10005 I=1,J                                                  L76M3830  00395
```

Figure 59. Continued.

```
      GC1=GC2+T1                                                         L76M3840  00396
      RSQ(I)= PI*(GC1**2-GC2**2)/(288.*SPAN(I+1))                        L76M3850  00397
10005 GC2=GC1                                                            L76M3860  00398
      WRITE(6,8826) (RSQ(I),I=1,18)                                      L76M3870  00399
      GO TO 9103                                                         L76M3880  00400
 9100 WRITE(6,9104) LSD2                                                 L76M3890  00401
 9104 FORMAT(1H0,11HNTRAN ERROR , 5I13)                                  L76M3900  00402
      STOP                                                               L76M3910  00403
 9103 IF(TCOP.EQ.'DRUM') GO TO 114                                       L76M3920  00404
      WRITE (28) ND1                                                     L76M3930  00405
  114 CONTINUE                                                           L76M3940  00406
      WRITE(28) (SINE(I),I=1,288),BLADES                                 L76M3950  00407
      END FILE 28                                                        L76M3960  00408
      LSD2= 1                                                            L76M3970  00409
C *** HARMONIC LOOP                                                      L76M3980  00410
      DO 83 M=MSTART,MLIMRN                                              L76M3990  00411
      REWIND 28                                                          L76M4000  00412
      FM = FM+1.                                                         L76M4010  00413
C                                                                        L76M4017  00414
C  CARD  L76M4020  BY PASSES  HARMONIC  GENERATION                       L76M4018  00415
C                                                                        L76M4019  00416
C     IF (TCOP .EQ. 'DRUM')  GO TO 111                                   L76M4020  00417
      READ (28) (ND1(I),I=1,7200)                                        L76M4030  00418
C *** RADIAL STATION LOOP                                                L76M4040  00419
      CALL NTRAN(29,10)                                                  L76M4050  00420
      DO 69 K=1,5                                                        L76M4060  00421
      IF(IRS(K).EQ.0) GO TO 69                                           L76M4070  00422
      T5=AA/(2.*RR(K)*BLADEL)                                            L76M4080  00423
C *** AZIMUTHAL LOOP                                                     L76M4090  00424
      DO 99 I=1,144                                                      L76M4100  00425
      T1=-T5                                                             L76M4110  00426
      T2= T5                                                             L76M4120  00427
      T3 =  (T2-T1)/40.                                                  L76M4130  00428
      T6=T1*BLADES*FM                                                    L76M4140  00429
      COSRN(1) = COS(T6)                                                 L76M4150  00430
      SINRN(1) = SIN(T6)                                                 L76M4160  00431
      T6=T2*BLADES*FM                                                    L76M4170  00432
      COSRN(41) = COS(T6)                                                L76M4180  00433
      SINRN(41) = SIN(T6)                                                L76M4190  00434
      AZ41(1)=T1                                                         L76M4200  00435
      AZ41(41)=T2                                                        L76M4210  00436
      L=0                                                                L76M4220  00437
      DO 71 J=2,40                                                       L76M4230  00438
      T1=T1+T3                                                           L76M4240  00439
      T6=T1*BLADES*FM                                                    L76M4250  00440
      AZ41(J)=T1                                                         L76M4260  00441
      COSRN(J) = COS(T6)                                                 L76M4270  00442
      SINRN(J) = SIN(T6)                                                 L76M4280  00443
   71 CONTINUE                                                           L76M4290  00444
      NT1 = NCH(K)+2                                                     L76M4300  00445
      KKK = 1                                                            L76M4310  00446
      CHORD(1)=0.                                                        L76M4320  00447
      GPSI(1)=0.                                                         L76M4330  00448
      DO 72 L=1,5                                                        L76M4340  00449
      IF(NCHAN(K,L).EQ.0) GO TO 72                                       L76M4350  00450
      KKK = KKK + 1                                                      L76M4360  00451
      CHORD(KKK) = XA(L,K)                                               L76M4370  00452
      GPSI(KKK) = DATA1(I,L,K)                                           L76M4380  00453
   72 CONTINUE                                                           L76M4390  00454
      CHORD(KKK+1) = 1.                                                  L76M4400  00455
      GPSI(KKK+1) = 0.                                                   L76M4410  00456
C *** THE MEASURED PRESSURE POINTS ALONG THE CHORD ARE INTERPOLATED TO   L76M4420  00457
C     41 POINTS                                                          L76M4430  00458
      CHORD2(1)=0.                                                       L76M4440  00459
      CHORD2(41) = 1.                                                    L76M4450  00460
      AREA = 1./41.                                                      L76M4460  00461
```

Figure 59. Continued.

```
      DO 9307 L=2,40                                                    L76M4470
 9307 CHORD2(L) = CHORD2(L-1) + AREA                                    L76M4480
      CALL CURVIT(NT1,CHORD,GPSI,W,41,CHORD2,GPSI2)                     L76M4490
      DO 73 L=1,41                                                      L76M4500
   73 GPSI3(L) = GPSI2(L)*COSRN(L)                                      L76M4510
      CALL AVQUAD(41,AZ41   ,GPSI3,AREA)                                L76M4520
      AREA = AREA*T4                                                    L76M4530
 9105 IF(LSD2+1) 9100,9105,9106                                         L76M4540
 9106 CALL NTRAN(29,1,1,AREA,LSD2)                                      L76M4550
      IF(IDD.NE.1) GO TO 2741                                           L76M4560
      IF(I.GT.10) GO TO 2741                                            L76M4570
      IF(K.GT.2) GO TO 2741                                             L76M4580
      WRITE(6,2742) I,K,M,NT1                                           L76M4590
 2742 FORMAT(1H0,2HI=,I5,5X,2HK=,I5,5X,2HM=,I5,10X,                     L76M4600
     X  33 HACOUSTIC PRESSURE PULSE COS TERM     ,10X,I5)               L76M4610
      WRITE(6,2747)  COSRN                                              L76M4620
      WRITE(6,2747)  CHORD                                              L76M4630
      WRITE(6,2747)  GPSI                                               L76M4640
      WRITE(6,2747)  CHORD2                                             L76M4650
      WRITE(6,2747)  GPSI2                                              L76M4660
      WRITE(6,2747)  T1,T2,T3,T4,T5,GMAR(I,K),AREA,FM                   L76M4670
 2747 FORMAT(2X,1P10E13.5)                                              L76M4680
 2741 DO 74 L=1,41                                                      L76M4690
   74 GPSI3(L) = GPSI2(L)*SINRN(L)                                      L76M4700
      CALL AVQUAD(41,AZ41   ,GPSI3,AREA)                                L76M4710
      AREA = AREA*T4                                                    L76M4720
 9107 IF(LSD2+1)9100,9107,9108                                          L76M4730
 9108 CALL NTRAN(29,1,1,AREA,LSD2)                                      L76M4740
   99 CONTINUE                                                          L76M4750
   69 CONTINUE                                                          L76M4760
 9200 IF(LSD2+1) 9100,9200,9201                                         L76M4770
 9201 CALL NTRAN(29,10)                                                 L76M4780
      DO 9109 K=1,5                                                     L76M4790
      DO 9109 I=1,144                                                   L76M4800
 9110 IF(LSD2+1) 9100,9110,9111                                         L76M4810
 9111 CALL NTRAN(29,2,1,AREA,LSD2)                                      L76M4820
 9112 IF(LSD2+1) 9100,9112,9113                                         L76M4830
 9113 GMAR(I,K)=AREA                                                    L76M4840
      CALL NTRAN(29,2,1,AREA,LSD2)                                      L76M4850
 9114 IF(LSD2+1) 9100,9114,9115                                         L76M4860
 9115 HMAR(I,K) = AREA                                                  L76M4870
 9109 CONTINUE                                                          L76M4880
C                                                                       L76M4887
C  CARDS  L76M4890   AND  L76M4900   STORE NEW HARMONICS ON DRUM        L76M4888
C                                                                       L76M4889
C      CALL DATCUR ('GMAR',ID(M),14,GMAR,720)                           L76M4890
C      CALL DATCUR ('HMAR',ID(M),14,HMAR,720)                           L76M4900
      GO TO 112                                                         L76M4910
C                                                                       L76M4917
C  CARDS  L76M4920   AND  L76M4930   READ IN HARMONICS FROM DRUM        L76M4918
C                                                                       L76M4919
C      CALL PCFDRD ('GMAR',ID(M),GMAR,720)                              L76M4920
C      CALL PCFDRD ('HMAR',ID(M),HMAR,720)                              L76M4930
  112 CONTINUE                                                          L76M4940
      WRITE(6,76) M                                                     L76M4950
   76 FORMAT(1H0,123HCOS AND SIN COEFFICIENTS OF ACOUSTIC PRESSURE PULSEL76M4960
     X AT EACH OF 144 AZIMUTHAL STATIONS AT EACH BLADE STATION FOR HARMOL76M4970
     XNIC M=,I3 )                                                       L76M4980
      DO 77 I=1,5                                                       L76M4990
      WRITE(6,78) I                                                     L76M5000
   78 FORMAT(1H0,14HBLADE STATION=,I2)                                  L76M5010
      WRITE(6,56) (GMAR(K,I),K=1,144)                                   L76M5020
   77 WRITE(6,56) (HMAR(K,I),K=1,144)                                   L76M5030
C *** THE FOLLOWING SUBR. INTERPOLATES ACOUSTIC PRESSURE PULSE HARMONICSL76M5040
C      UP TO 288 AZIMUTH AND 20 BLADE STATIONS                          L76M5050
   75 IF(IDD.NE.1) GO TO 9303                                           L76M5060
```

Figure 59. Continued.

```
      CALL CLOCK
 9303 CALL INTERP
      IF(IDD.NE.1) GO TO 79
      CALL CLOCK
      WRITE(6,80) LAZI,LSPAN
   80 FORMAT(1H1, 51HINTERPOLATED ACOUSTIC PRESSURE PULSE COEFFICIENTS (
     X ,I3,1X,17HAZIMUTH STATIONS, ,I3,1X,17HBLADE STATIONS  )  ///)
      DO 81 I=1,LSPAN
      WRITE(6,82) SPAN(I)
   82 FORMAT(1H0,11HBLADE SPAN=, F8.2,10X,21HGMARI(J,I),HMARI(J,I)   )
      WRITE(6,56) (GMARI(J,I),J=1,LAZI)
   81 WRITE(6,56) (HMARI(J,I),J=1,LAZI)
C *** DOUBLE INTEGRATION FOLLOWS
   79 ISI = (DPSI/2.5)+.01
      T1 = BB/(4.*PI)
C *** FIELD POINT LOOP
      DO 83 NFIELD=1,NFT
      MFIELD = NFIELD
      IF(INTERM.EQ.NO)GO TO 84
      WRITE(6,85) NFIELD,XFP(NFIELD),YFP(NFIELD),ZFP(NFIELD),M
   85 FORMAT(1H1, 12HFIELD POINT=,I3,5X, 4HXFP=,1PE10.4,5X,4HYFP=,1PE10.
     X 4,5X, 4HZFP=,1PE10.4,15X, 11HHARMONIC M=,I3 )
C *** SUBR. CUE WILL CALCULATE Q1 AND Q2=Q1*Q2  Q1(288,20),Q2(288,20)
   84 READ(28) (SINE(I),I=1,288),BLADES
      BACKSPACE 28
      CALL CUE(2,FM,MFIELD)
      IF(INTERM.EQ.NO)GO TO 86
      WRITE(6,87) LAZI,LSPAN
   87 FORMAT(1H0, 3HQ1(,I3,1H,,I2,1H))
      DO 88 I=1,LSPAN
      WRITE(6,89) I,XO(I)
   89 FORMAT(1H0, 13HSPAN STATION=,I3, 1H(, F6.3,1H) )
   88 WRITE(6,90) (Q1(J,I),J=1,LAZI)
   90 FORMAT( 2X,13(1PE10.3))
C *** THE FOLLOWING LOOP EFFECTS A DOUBLE INTEGRATION WHICH YIELDS THE
C     SOUND PRESSURE COMPONENTS UMF(M,NFIELD) AND VMF(M,NFIELD).
   86 DO 91 K=1,2
      IF(INTERM.EQ.NO) GO TO 92
      I=K+1
      WRITE(6,93) I,LAZI,LSPAN
   93 FORMAT(1H0, 1HQ,I1,1H(,I3,1H,,I2,1H))
      DO 94 I=1,LSPAN
      WRITE(6,89) I,XO(I)
   94 WRITE(6,90) (Q2(J,I),J=1,LAZI)
C *** A DOUBLE INTEGRATION IS DONE NEXT.
   92 IF(IDD.NE.1) GO TO 9304
      CALL CLOCK
C RING ITEGRATION
      IAUDRE=LSPAN-2
      AREA=0.
      DO 10006 J=1,IAUDRE
      QAVR = 0.
      DO 10007 I=1,LAZI
10007 QAVR=QAVR+Q2(I,J+1)
      QAVR=QAVR*RSQ(J)
      WRITE(6,10008) J,QAVR
10008 FORMAT(  5H RING,I3,20X,E13.5)
10006 AREA=AREA+QAVR
      IF(K.EQ.2) GO TO 10009
      URING=AREA*T1
      GO TO 10010
10009 VRING=AREA*T1
10010 CONTINUE
 9304 IAUDRE = LSPAN-1
      DO 8820 I=1,LAZI
      DBI(I)=0.
```

Figure 59. Continued.

```
      DO 8821 J=2,IAUDRE
 8821 DBI(I)=DBI(I)+Q2(I,J)
 8820 DBI(I)= (DBI(I)*2.+Q2(I,1)+Q2(I,LSPAN))*DELSPN
      DBI(LAZI+1) = DBI(1)
      IF(IDD.NE.1) GO TO 8825
      WRITE(6,8826) (DBI(I),I=1,145),DELSPN
 8826 FORMAT(1H0,1X,10E13.5)
      CALL SIMCOR(LAZI+1,DPRAD,DBI,QAVR,I)
      TEMP1(K)=QAVR
 8825 QAVR = 0.
      DO 9701 I=1,LAZI
 9701 QAVR=QAVR+DBI(I)
      QAVR=QAVR*DPRAD*T1
      IF(K.EQ.2) GO TO 9703
      UTRAP=QAVR
      GO TO 9702
 9703 VTRAP=QAVR
C SIMPSON S
 9702 IF(IDD.NE.1) GO TO 9305
      QAVR=2.*DELSPN
      DO 10000 I=1,LAZI
      DO 10001 J=1,IAUDRE
10001 AZ41(J)=Q2(I,J+1)
      CALL SIMCOR(IAUDRE,QAVR,AZ41,AREA,J)
10000 DBI(I)=AREA
      DBI(LAZI+1) = DBI(1)
      WRITE(6,8826) (DBI(I),I=1,145),QAVR
      CALL SIMCOR(LAZI+1,DPRAD,DBI,QAVR,I)
      IF(K.EQ.2) GO TO 10002
      USIMP=QAVR*T1
      GO TO 10003
10002 VSIMP=QAVR*T1
10003 WRITE(6,2222) TEMP1(K),RO,BLADEL,T1,BB
 2222 FORMAT(1H0,5E20.6)
      CALL CLOCK
      QAVR=0.
      DO 901 IROMA=1,20
      DO 901 IAUDRE=1,144
  901 QAVR=QAVR+Q2(IAUDRE,IROMA)
      QAVR=QAVR/2880.
      WRITE(6,902) QAVR
  902 FORMAT (1H0,11HQ AVERAGE=     ,1PE20.5)
 9305 IF(K.EQ.2) GO TO 91
C *** SUBR. CUE WILL CALCULATE Q2=Q1*Q2
      READ(28) (SINE(I),I=1,288),BLADES
      BACKSPACE 28
      CALL CUE(3,FM,NFIELD)
   91 CONTINUE
      XU(M,NFIELD)=UTRAP
      XV(M,NFIELD)=VTRAP
      READ(28) (SINE(I),I=1,288),BLADES
      BACKSPACE 28
      TEMP1(1)        = TEMP1(1)*T1
      TEMP1(2)        = TEMP1(2)*T1
      IF(IDD.NE.1) GO TO 95
      WRITE(6,9704)
 9704 FORMAT(1H0,85 HTHE FOLLOWING ANSWERS ARE OBTAINED BY USING TRAPAZO
     XIDAL INTERGRATION ALONG THE BLADE, /                              )
     X 44HAND SIMPSON S INTEGRATION ALONG THE AZIMUTH.
      WRITE(6,96) M,NFIELD,TEMP1(1)       ,M,NFIELD,TEMP1(2)
   96 FORMAT(1H0,   4HUMF(,I2,1H,,I2,3H) =,1PE10.4,13X,
     X              4HVMF(,I2,1H,,I2,3H) =,1PE10.4 )
C *** SOUND PRESSURE AND SOUND PRESSURE LEVEL ARE CALCULATED NEXT
   95 PMRMS(M,NFIELD) = (1./1.41421356)*SQRT(UTRAP**2+VTRAP**2)
      SPLM(M,NFIELD) = 20.*ALOG10(PMRMS(M,NFIELD)/2.9E-09)
      IF(INTERM.EQ.NO) GO TO 31000
```

Figure 59. Concluded.

```
      WRITE(6,97) M,NFIELD,PMRMS(M,NFIELD),M,NFIELD,SPLM(M,NFIELD)        L76M6390
   97 FORMAT(1H0,  6HPMRMS(,I2,1H,,I2,3H) =,1PE10.4,10X,                  L76M6400
     X              6H SPLM(,I2,1H,,I2,3H) =,1PE10.4 )                   L76M6410
31000 IF(IDD.NE.1) GO TO 83                                               L76M6420
      WRITE(6,9705)                                                       L76M6430
 9705 FORMAT(1H0,95 HTHE FOLLOWING ANSWERS ARE OBTAINED BY USING TRAPAZOL76M6440
     XIDAL INTEGRATION ALONG THE BLADE AND AZIMUTH      )                 L76M6450
      WRITE(6,96) M,NFIELD,    P,M,NFIELD,VTRAP                           L76M6460
      UTRAP=(1./1.41421356)*SQRT(UTRAP**2+VTRAP**2)                       L76M6470
      VTRAP=20.*ALOG10(UTRAP/2.9E-09)                                     L76M6480
      WRITE(6,97) M,NFIELD,UTRAP,M,NFIELD,VTRAP                           L76M6490
      WRITE(6,10004)                                                      L76M6500
10004 FORMAT(1H0, 17H SIMPSON, SIMPSON    )                               L76M6510
      WRITE(6,96) M,NFIELD,USIMP,M,NFIELD,VSIMP                           L76M6520
      USIMP= (1./1.41421356)*SQRT(USIMP**2+VSIMP**2)                      L76M6530
      VSIMP=20.*ALOG10(USIMP/2.9E-09)                                     L76M6540
      WRITE(6,97) M,NFIELD,USIMP,M,NFIELD,VSIMP                           L76M6550
      WRITE(6,10011)                                                      L76M6560
10011 FORMAT(1H0,   6H RINGS   )                                          L76M6570
      WRITE(6,96) M,NFIELD,URING,M,NFIELD,VRING                           L76M6580
      URING=(1./1.41421356)*SQRT(URING**2+VRING**2)                       L76M6590
      VRING=20.*ALOG10(URING/2.9E-09)                                     L76M6600
      WRITE(6,97) M,NFIELD,URING,M,NFIELD,VRING                           L76M6610
   83 CONTINUE                                                            L76M6620
      DO 115 I=1,NFT                                                      L76M6630
      WRITE (6,116) I,(XU(J,I),J=1,MLIMRN)                                L76M6640
  116 FORMAT('OUTRAP VALUES FOR FIELD POINT'I3/(1P10E13.6))               L76M6650
      WRITE (6,117) I,(XV(J,I),J=1,MLIMRN)                                L76M6660
  117 FORMAT('OVTRAP VALUES FOR FIELD POINT'I3/(1P10E13.6))               L76M6670
  115 CONTINUE                                                            L76M6680
      DO 98  I=1,MLIMRN                                                   L76M6690
      COSARG(1,I)=1.                                                      L76M6700
   98 SINARG(1,I)=0.                                                      L76M6710
      DT=TOTIME/(NTIME-1)                                                 L76M6720
      FAC=BLADES*OMEG*PI/30.*DT                                           L76M6730
      FAC2=0.                                                             L76M6740
      DO 100 I=2,NTIME                                                    L76M6750
      FAC2=FAC2+FAC                                                       L76M6760
      DO 100 J=1,MLIMRN                                                   L76M6770
      ARG=FAC2*J                                                          L76M6780
      COSARG(I,J)=COS(ARG)                                                L76M6790
  100 SINARG(I,J)=SIN(ARG)                                                L76M6800
      DO 101 I=1,NFT                                                      L76M6810
      DO 102 J=1,NTIME                                                    L76M6820
      SUM=0.                                                              L76M6830
      DO 103 K=1,MLIMRN                                                   L76M6840
  103 SUM=SUM+XU(K,I)*COSARG(J,K)+XV(K,I)*SINARG(J,K)                     L76M6850
  102 P(J)=SUM                                                            L76M6860
  101 WRITE (6,104) I,(P(J),J=1,NTIME)                                    L76M6870
  104 FORMAT(//'OPRESSURES AT FIELD POINT'I4//(1P10E13.6))                L76M6880
C *** THE FOLLOWING SUBR. PRINTS OUT SOUND PRESSURE LEVELS FOR ALL        L76M6890
C     CALCULATED HARMONICS.                                               L76M6900
      CALL OUTSPL                                                         L76M6910
      IF(IDD.NE.1) GO TO 105                                              L76M6920
      CALL CLOCK                                                          L76M6930
  105 IF(TCOP.NE.'DRUM') GO TO 7                                          L76M6940
      END                                                                 L76M6950
@1  FOR  BLODAT
      BLOCK DATA                                                          L76B0010
       COMMON /BK1/ IDD,BB,AA,XA(5,5),DPSI,RR(5),OMEG,CC,NBLADE,MLIMRN,   L76B0020
     * MLIMOP,XFP(20),YFP(20),ZFP(20),GAMA,RO,BLADEL,B0,B1C,B1S,PUNCH,    L76B0030
     * LSPAN,FROC(30),TCOP,SLOPE(10,5),OFFSET(10,5),KUNIT(5),IBURST,      L76B0040
     * IRS(5),ITRACK(5),FI(5,5),NCHAN(5,5),E3860P,NFT,ANG,KEY1,KEY2,      L76B0050
     * KEY3,NHH,CAPRF(20),THETAF(20),ALFAF(20),OPRONO,NCH(5),INTERM,      L76B0060
     * IREEL,NC,NTBDX(5,10),NSTATC(5,10),NSTATR(5,10),ISET(5),IREELS,     L76B0070
     * NOCH(5),LAZI                                                       L76B0080
```

a. End of E676, Start of BLODAT

Figure 60. Subroutines.

```
      COMMON /BK2/ NCYCLE,CYCLES,KU,NDIV(4),BMASK(6),NN(435),LIRS,
     * KTRACK,KBURST,KREC,ND1(144,10,5),ND2(144,10,5),XLO(7),XLM(7,40),
     * XMM(7,40),TEMP1(7),TEMP2(7),TEMP3(7),PI,AZMTH2(144),AZMTH(144),
     * DPRAD,AZRAD,NO,YES,NBLANK,TEE,BEE,DEE,GMARI(288,20),
     * HMARI(288,20),XO(20)
      COMMON /BK3/ SPLM(10,20),AZMTH3(288),
     * SPAN(20),                                    PMRMS(10,20),
     * ICHANL(10,5),COSINE(288),SINE(288),BLADES,CARD,TAPE
      DIMENSION CN(31,5,5),SN(30,5,5),AN(31,10,5),BN(30,10,5),
     * GMAR(144,5),HMAR(144,5)
     * ,Q1(288,20),Q2(288,20)
      EQUIVALENCE    (ND2(5761),HMAR),
     $               (GMARI,AN),
     * (GMARI(1551),BN),(HMARI,CN),(HMARI(776),SN),(ND2,Q2)
      EQUIVALENCE (ND1(5761),GMAR),(ND1,Q1)
C IRS(I) IS AN INSTRUMENTED RADIAL STATION COUNTER, COUNTING FROM THE
C     BLADE ROOT.
C IF IRS(I)=0, THEN THAT STATION IS NO GOOD.
      DATA (IRS(I),I=1,5) /1,2,3,4,5/
C NCHAN(I,J) IS AN ISTRUMENTED CHORD STATION COUNTER J FOR EACH RADIAL
C     STATION I
C IF CHORD STATION J IS NO GOOD, THEN NCHAN(I,J)=0
      DATA ((NCHAN(I,J),J=1,5),I=1,5)/1,2,3,0,5, 1,2,3,4,5, 1,2,3,4,5,
     X 1,2,3,4,3, 1,2,3,4,5/
C NCH(I) IS THE TOTAL NO. OF CHORD STATIONS FOR RADIAL STATION I.
      DATA (NCH(I),I=1,5)/5,5,5,5,5/
C FI(I,J) GAUSSIAN INTEGRATION FACTORS FOR RADIAL STATIONI, CHORD
C     STATION J.
      DATA ((FI(I,J),J=1,5),I=1,5) /.1,.1,.222,.355,.222,
     X .1,.1,.222,.355,.222,            .1,.1,.222,.355,.222,
     X .1,.1,.222,.355,.222,            .1,.1,.222,.355,.222 /
      DATA (NDIV(I),I=1,4)/0 001 000 000 000, 0 000 001 000 000,
     X 0 000 000 001 000, 0 000 000 000 001/,(BMASK(I),I=1,6)/
     X 0 777 000 000 000, 0 000 777 000 000, 0 000 000 777 000,
     X 0 000 000 000 777, 0 777 777 000 000, 0 000 000 777 777/,
     X YES/1HY/,NO/1HN/,TAPE/4HTAPE/,CARD/4HCARD/
      DATA TEE,BEE,DEE /1HT,1HB,1HD/
      END
@I  FOR  INPUTA
      SUBROUTINE INPUTA
C THIS SUBR. RECEIVES CARD INPUT
      COMMON /BK1/ IDD,BB,AA,XA(5,5),DPSI,RR(5),OMEG,CC,NBLADE,MLIMRN,
     * MLIMDP,XFP(20),YFP(20),ZFP(20),GAMA,RO,BLADEL,BO,B1C,B1S,PUNCH,
     * LSPAN,FROC(30),TCOP,SLOPE(10,5),OFFSET(10,5),KUNIT(5),IBURST,
     * IRS(5),ITRACK(5),FI(5,5),NCHAN(5,5),E3860P,NFT,ANG,KEY1,KEY2,
     * KEY3,NHH,CAPRF(20),THETAF(20),ALFAF(20),OPRONO,HCH(5),INTERM,
     * IREEL,NC,NTBDX(5,10),NSTATC(5,10),NSTATR(5,10),ISET(5),IREELS,
     * NOCH(5),LAZI
      COMMON /BK2/ NCYCLE,CYCLES,KU,NDIV(4),BMASK(6),NN(435),LIRS,
     * KTRACK,KBURST,KREC,ND1(144,10,5),ND2(144,10,5),XLO(7),XLM(7,40),
     * XMM(7,40),TEMP1(7),TEMP2(7),TEMP3(7),PI,AZMTH2(144),AZMTH(144),
     * DPRAD,AZRAD,NO,YES,NBLANK,TEE,BEE,DEE,GMARI(288,20),
     * HMARI(288,20),XO(20)
      COMMON /BK3/ SPLM(10,20),AZMTH3(288),
     * SPAN(20),                                    PMRMS(10,20),
     * ICHANL(10,5),COSINE(288),SINE(288),BLADES,CARD,TAPE
      EQUIVALENCE    (ND2(5761),HMAR),
     $               (GMARI,AN),
     * (GMARI(1551),BN),(HMARI,CN),(HMARI(776),SN),(ND2,Q2)
      DIMENSION CN(31,5,5),SN(30,5,5),AN(31,10,5),BN(30,10,5),
     * GMAR(144,5),HMAR(144,5)
     * ,Q1(288,20),Q2(288,20)
      EQUIVALENCE (ND1(5761),GMAR),(ND1,Q1)
      COMMON /NEW/ F0,F1C,F1S,TOTIME,THETA
      INTEGER TCOP,CARD,TAPE,E3860P,YES,OPRONO
      READ(5,1) (NN(I),I=1,14)
```

b. End of BLODAT, Start of INPUTA

Figure 60. Continued.

```
    1 FORMAT( 13A6,A2 )
      WRITE(6,2) (NN(I),I=1,14)
    2 FORMAT(1H1,25X,13A6,A2)
      READ(5,3) BB,AA,BLADEL,GAMA,RO,CC,OMEG,DPSI,NBLADE,MLIMOP,MLIMRN,
     * LSPAN,IREELS,TCOP,PUNCH,INTERM,IOD
    3 FORMAT( 8E7.0,1X,I1,3(1X,I2),1X,I1,1X,A4,2(1X,A1),1X,I1)
      READ (5,15) RR,XA
   15 FORMAT(5F10.0)
      READ (5,15) TOTIME,THETA
      IF(TCOP.NE.TAPE) GO TO 45
      DO 100 I=1,5
      DO 100 JJ=1,10
      NSTATC(I,JJ) = 100
  100 NSTATR(I,JJ) = 100
      DO 16 JJ=1,IREELS
      READ(5,4) IREEL,ITRACK(IREEL),ISET(IREEL),KUNIT(IREEL)
      WRITE(6,77)
     X              IREEL,ITRACK(IREEL),ISET(IREEL),KUNIT(IREEL)
   77 FORMAT( 5I13)
    4 FORMAT(I1,2(1X,I2),6X,I2)
      NOCH(IREEL)= 0
    6 READ(5,5) NC,NTBDX(IREEL,NC),NSTATC(IREEL,NC),NSTATR(IREEL,NC),
     * SLOPE(NC,IREEL),OFFSET(NC,IREEL),NCEND
    5 FORMAT(2X,I2,1X,A1,2(1X,I1),1X,E13.1,3X,E13.1,39X,I1)
      NOCH(IREEL) = NOCH(IREEL)+1
      K=NOCH(IREEL)
      ICHANL(K,JJ) = NC
      IF(NCEND.EQ.0) GO TO 6
   16 CONTINUE
      READ(5,7) (FROC(J),J=1,30)
    7 FORMAT(6E13.1,2X)
   45 READ(5,8) E3860P,OPRONO,NFT
    8 FORMAT(1X,2(1X,A1),2X,I2)
      IF(E3860P.NE.YES)GO TO 9
      READ(5,10) ANG,NHH,KEY1,KEY2,KEY3
   10 FORMAT( E7.0,4(2X,I2))
    9 DO 11 I=1,NFT
      IF(E3860P.NE.YES)GO TO 12
      READ(5,13) CAPRF(I),THETAF(I),ALFAF(I),XFP(I),YFP(I),ZFP(I)
   13 FORMAT( 3E10.1,20X,3E10.1)
      GO TO 11
   12 READ(5,14) XFP(I),YFP(I),ZFP(I)
   14 FORMAT( 50X,3E10.1)
   11 CONTINUE
C *** NOW THE INPUT IS PRINTED OUT.
      WRITE(6,20) BB,RO,AA,CC,BLADEL,OMEG,DPSI,GAMA
   20 FORMAT(1H0,1X, 28HBLADE THICKNESS (IN)        = , E10.4, 8X,
     1 35HZERO TWIST BLADE STA.       (IN)    = , E10.4 //  2X,
     2 28HBLADE CHORD          (IN)       = ,E10.4, 8X,35HSPEED OF SOUND
     3    (IN/SEC)  = ,E10.4 //  2X,28HBLADE LENGTH       (IN)       =
     3 , E10.4,8X,
     4 35HROTOR ROT. SPEED             (RPM)  = ,E10.4   //   48X,35HAZIMUTH
     5INCREMENT            (DEG)    = ,E10.4 /   2X, 28HBLADE TWIST RATE (DEG/
     6IN) = ,E10.4 )
      WRITE(6,21) NBLADE,TCOP,MLIMOP,PUNCH,MLIMRN,INTERM,LSPAN,IREELS
   21 FORMAT('0 NUMBER OF BLADES'32X'= 'I2,14X'TAPE / CARD / DRUM  OPTIO
     $N'7X'= 'A4//2X                   49HNO. OF HARMONICS TO REPRESENT PRE
     2SSURE CYCLES    =  , I3, 14X, 35HPRESSURE HARMONIC PUNCH OPTION    =
     3 , A1 // 2X, 28HNO. OF ROTOR NOISE HARMONICS, 20X,2H= , I2, 14X,
     4 26HINTERMEDIATE OUTPUT OPTION, 7X, 2H= , A1 // 2X, 33HNO. OF INTE
     5RPOLATED SPAN STATIONS, 15X, 2H= , I2 // 2X, 23HTOTAL NO. OF TAPE
     6REELS, 25X,2H= , I2 /  )
      WRITE (6,17) THETA,TOTIME
   17 FORMAT('0COMBINED ROTOR SHAFT INCLINATION AND FUSELAGE PITCH ATTIT
     $UDE = 'E10.4,'  DEGREES'/'0TOTAL TIME FOR ACOUSTIC PRESSURE COMPUT
     $ATIONS IS 'E10.4,'  SECONDS')
```

c. INPUTA Continued

Figure 60. Continued.

```
      IF(ICUP.NE.TAPE) GO TO 46
      DO 22 IREEL=1,IREELS
      WRITE(6,23) IREEL,ITRACK(IREEL),ISET(IREEL),KUNIT(IREEL)
   23 FORMAT(1H0,1X, 11HREEL NO. = ,I1, 4X,12HTRACK NO. = , I2, 4X,
     1 10HSET NO. = , I2, 4X, 24HLOGICAL TAPE UNIT NO. = , I2 //  8X,
     2  7HCHANNEL, 24X, 5HSLOPE, 14X, 6HOFFSET )
      K=NOCH(IREEL)
      DO 22 I=1,K
      NC = ICHANL(I,IREEL)
      WRITE(6,24) NC,NTBDX(IREEL,NC),NSTATC(IREEL,NC),NSTATR(IREEL,NC),
     1 SLOPE(NC,IREEL),OFFSET(NC,IREEL)
   24 FORMAT( 10X,I2,6X,A1,6X,I1,6X,I1,6X,1PE12.6,7X,  E12.6  )
      SLOPE(NC,IREEL) = SLOPE(NC,IREEL)/256.
   22 CONTINUE
      WRITE(6,25)
   25 FORMAT(//// 3X, 8HHARMONIC, 5X,18HFREQ. CORR. FACTOR, 19X,8HHARMON
     1IC, 5X, 18HFREQ. CORR. FACTOR // )
      DO 26 J=1,15
      JJ = J+15
      WRITE(6,63) J,FROC(J),JJ,FROC(JJ)
   63 FORMAT( 10X,I2,13X,1PE11.4,25X,I2,13X,1PE11.4)
   26 CONTINUE
   46 WRITE(6,27) E386OP,OPRONO,NFT
   27 FORMAT( 2H0 , 62HOPTION TO USE PROGRAM E386 (THEORETICAL CONST. PR
     1ESSURE PULSE) ,8X,2H= , A1 //  2X, 59HOPTION TO USE ROTOR NOISE PR
     2OGRAM (MEASURED PRESSURE PULSE) ,11X, 2H= , A1 //  2X, 19HNO. OF F
     3IELD POINTS, 51X, 1H= , I2 //  )
      IF(E386OP.NE.YES)GO TO 28
      WRITE(6,29) ANG,NHH,KEY1,KEY2,KEY3
   29 FORMAT(2X, 43HINCR. OF INTEGRATION USED IN E386 (DEG.) = , F7.4,
     1 4X, 28HNO. OF AIR LOAD HARMONICS = ,I2,4X, 6HKEY1= ,I2,2X,6HKEY2=
     2 ,I2,2X,6HKEY3= ,I2///)
C *** FIELD POINTS PRINTED OUT NEXT.
   28 IF(E386OP.NE.YES.AND.OPRONO.NE.YES) GO TO 60
      WRITE(6,36)
   36 FORMAT(    25X,17HE386 FIELD POINTS, 32X,24HROTOR NOISE FIELD POINT
     1S //  6X,2HFP,7X,  6HR (FT),7X, 24HTHETA (DEG)  ALPHA (DEG), 9X,
     2 2HFP, 7X, 6HX (IN), 7X,6HY (IN),7X,6HZ (IN) / )
      GO TO 31
   60 IF(E386OP.NE.YES) GO TO 30
      WRITE(6,37)
   37 FORMAT(    25X,17HE386 FIELD POINTS // 6X,2HFP, 7X, 6HR (FT), 7X,
     1 24HTHETA (DEG)  ALPHA (DEG) / )
      GO TO 31
   30 WRITE(6,38)
   38 FORMAT( 74X, 24HROTOR NOISE FIELD POINTS // 61X, 2HFP, 7X, 6HX (IN
     1), 7X,6HY (IN),7X,6HZ (IN) /  )
   31 DO 32 I=1,NFT
      IF(E386OP.NE.YES.AND.OPRONO.NE.YES) GO TO 33
      WRITE(6,39) I,CAPRF(I),THETAF(I),ALFAF(I),I,XFP(I),YFP(I),ZFP(I)
   39 FORMAT( 6X,I2,4X, 3(3X,E10.4),10X,I2,2X, 3(3X,E10.4)  )
      GO TO 32
   33 IF(E386OP.NE.YES) GO TO 34
      WRITE(6,39) I,CAPRF(I),THETAF(I),ALFAF(I)
      GO TO 32
   34 WRITE(6,40) I,XFP(I),YFP(I),ZFP(I)
   40 FORMAT( 61X,I2,2X, 3(3X,E10.4) )
   32 CONTINUE
      RETURN
      END
@I  FOR  RDKU
      SUBROUTINE RDKU(N)
C *** THIS SUBR. READS THE PROPER TAPE (UNIT 8,9,10,11, OR 12)
      COMMON /BK1/ IDD,BB,AA,XA(5,5),DPSI,RR(5),OMEG,CC,NBLADE,MLIMRN,
     * MLIMDP,XFP(20),YFP(20),ZFP(20),GAMA,R0,BLADEL,B0,B1C,B1S,PUNCH,
     * LSPAN,FROC(30),TCOP,SLOPE(10,5),OFFSET(10,5),KUNIT(5),IBURST,
```

d. End of INPUTA, Start of RDKU

Figure 60. Continued.

```
     * IRS(5),ITRACK(5),FI(5,5),NCHAN(5,5),E3860P,NFT,ANG,KEY1,KEY2,
     * KEY3,NHH,CAPRF(20),THETAF(20),ALFAF(20),OPRONO,NCH(5),INTERM,
     * IREEL,NC,NTBDX(5,10),NSTATC(5,10),NSTATR(5,10),ISET(5),IREELS,
     * NOCH(5),LAZI
      COMMON /BK2/ NCYCLE,CYCLES,KU,NDIV(4),BMASK(6),NN(435),LIRS,
     * KTRACK,KBURST,KREC,ND1(144,10,5),ND2(144,10,5),XLO(7),XLM(7,40),
     * XMM(7,40),TEMP1(7),TEMP2(7),TEMP3(7),PI,AZMTH2(144),AZMTH(144),
     * DPRAD,AZRAD,NO,YES,NBLANK,TEE,BEE,DEE,GMARI(288,20),
     * HMARI(288,20),XO(20)
      DIMENSION CN(31,5,5),SN(30,5,5),AN(31,10,5),BN(30,10,5),
     * GMAR(144,5),HMAR(144,5)
      DIMENSION NNPS(219)
      EQUIVALENCE   (ND2(5761),HMAR),
     5              (GMARI,AN),
     * (GMARI(1551),BN),(HMARI,CN),(HMARI(776),SN)
      EQUIVALENCE (FTRACK,KTRACK),(FBURST,KBURST),(FREC,KREC)
      EQUIVALENCE (ND1(5761),GMAR)
      GO TO (1,2),N
    1 LIM1 = 1
      LIM2 = 219
      GO TO 3
    2 LIM1 = 217
      LIM2 = 435
    3 I=KU-7
      GO TO (4,5,6,7,8),I
    4 READ(8) (NN(I),I=LIM1,LIM2)
      GO TO 9
    5 READ(9) (NN(I),I=LIM1,LIM2)
      GO TO 9
    6 READ(10)(NN(I),I=LIM1,LIM2)
      GO TO 9
    7 READ(11)(NN(I),I=LIM1,LIM2)
      GO TO 9
    8 READ(12)(NN(I),I=LIM1,LIM2)
      READ (13) (NNPS(I),I=1,219)
      I=-1
      DO 20 J=LIM1,LIM2,3
      I=I+3
   20 NN(J)=NNPS(I)
    9 FTRACK = AND(NN(LIM2-2),BMASK(6))
      FBURST = AND(NN(LIM2-1),BMASK(6))
      FREC   = AND(NN(LIM2)  ,BMASK(6))
      IF(IDD.EQ.1)
     XWRITE(6,10) (NN(I),I=LIM1,LIM2)
   10 FORMAT(1H0, 19H(NN(I),I=LIM1,LIM2) / (2X,10013))
      RETURN
      END
@I  FOR  UNPACK
      SUBROUTINE UNPACK
C *** THIS SUBR. UNPACKS A CYCLE NN(435) TO FORM THE ARRAY
C     ND1(144,10,IREEL)
C     WHERE THE FIRST SUBSCRIPT REPRESENTS AZIMUTH, AND THE SECOND ARRAY
C     REPRESENTS CHANNEL NO.
       COMMON /BK1/ IDD,BB,AA,XA(5,5),DPSI,RR(5),OMEG,CC,NBLADE,MLIMRN,
     * MLIMDP,XFP(20),YFP(20),ZFP(20),GAMA,RO,BLADEL,BO,B1C,B1S,PUNCH,
     * LSPAN,FROC(30),TCOP,SLOPE(10,5),OFFSET(10,5),KUNIT(5),IBURST,
     * IRS(5),ITRACK(5),FI(5,5),NCHAN(5,5),E3860P,NFT,ANG,KEY1,KEY2,
     * KEY3,NHH,CAPRF(20),THETAF(20),ALFAF(20),OPRONO,NCH(5),INTERM,
     * IREEL,NC,NTBDX(5,10),NSTATC(5,10),NSTATR(5,10),ISET(5),IREELS,
     * NOCH(5),LAZI
      COMMON /BK2/ NCYCLE,CYCLES,KU,NDIV(4),BMASK(6),NN(435),LIRS,
     * KTRACK,KBURST,KREC,ND1(144,10,5),ND2(144,10,5),XLO(7),XLM(7,40),
     * XMM(7,40),TEMP1(7),TEMP2(7),TEMP3(7),PI,AZMTH2(144),AZMTH(144),
     * DPRAD,AZRAD,NO,YES,NBLANK,TEE,BEE,DEE,GMARI(288,20),
     * HMARI(288,20),XO(20)
      EQUIVALENCE   (ND2(5761),HMAR),
```

e. End of RDKU, Start of UNPACK

Figure 60. Continued.

```
$                     (GMARI,AN),
     * (GMARI(1551),BN),(HMARI,CN),(HMAPI(776),SN)
      DIMENSION CN(31,5,5),SN(30,5,5),AN(31,10,5),BN(30,10,5),
     * GMAR(144,5),HMAR(144,5)
      EQUIVALENCE (ND1(5761),GMAR)
      DATA SIN/O 400 000 000 000/
      EQUIVALENCE  (V2,IV2)
      WRITE(6,6) NN
    6 FORMAT(2X,10O15)
      NW = 0
C *** AZIMUTH POINT LOOP
      DO 1 I=1,144
      NCT = 0
C *** WORDS IN A FRAME LOOP
      DO 1 J=1,3
      NW = NW+1
      N10 = 5
C *** DATA WORDS TO UNPACK LOOP
      DO 1 K=1,4
      N10 = N10-1
      IF(J.EQ.3.AND.K.GT.2) GO TO 1
      NCT = NCT+1
      N1 = NN(NW)
      IF(K.EQ.1) GO TO 2
      N1 = N1*NDIV(N10)
    2 N1 = N1/NDIV(1)
      IV2=N1
      V2=AND(V2,SIN)
      IV2=IV2/2
      IF(IV2.NE.0) N1=N1-1
      ND1(I,NCT,IREEL) = N1
    1 CONTINUE
      IF(IDD.NE.1.AND.NCYCLE.GT.0) RETURN
      WRITE(6,5) IREEL,(ND1(1,K,IREEL),K=1,10)
    5 FORMAT(1H0,  6HIREEL=,I3,10X,
     X 18HND1(144,10,IREEL)  /2X,10I13)
      RETURN
      END
@I  FOR  MERGES
      SUBROUTINE MERGES
C *** THIS SUBR. PRODUCES DIFFERENTIAL PRESSURES FROM ABSOLUTE TOP AND
C     BOTTOM READINGS.
       COMMON /BK1/ IDD,BB,AA,XA(5,5),DPSI,RR(5),OMEG,CC,NBLADE,MLIMRN,
     * MLIMDP,XFP(20),YFP(20),ZFP(20),GAMA,R0,BLADEL,B0,B1C,B1S,PUNCH,
     * LSPAN,FROC(30),TCOP,SLOPE(10,5),OFFSET(10,5),KUNIT(5),IBURST,
     * IRS(5),ITRACK(5),FI(5,5),NCHAN(5,5),E3860P,NFT,ANG,KEY1,KEY2,
     * KEY3,NHH,CAPRF(20),THETAF(20),ALFAF(20),OPRONO,NCH(5),INTERM,
     * IREEL,NC,NTBDX(5,10),NSTATC(5,10),NSTATR(5,10),ISCT(5),IREELS,
     * NOCH(5),LAZI
       COMMON /NEW/ F0,F1C,F1S
      COMMON /BK2/ NCYCLE,CYCLES,KU,NDIV(4),BMASK(6),NN(435),LIRS,
     * KTRACK,KBURST,KREC,ND1(144,10,5),ND2(144,10,5),XL0(7),XLM(7,40),
     * XMM(7,40),TEMP1(7),TEMP2(7),TEMP3(7),PI,AZMTH2(144),AZMTH(144),
     * DPRAD,AZRAD,NO,YES,NBLANK,TEE,BEE,DEE,GMARI(288,20),
     * HMARI(288,20),X0(20)
      DIMENSION CN(31,5,5),SN(30,5,5),AN(31,10,5),BN(30,10,5),
     * GMAR(144,5),HMAR(144,5)
      EQUIVALENCE    (ND2(5761),HMAR),
     $               (GMARI,AN),
     * (GMARI(1551),BN),(HMARI,CN),(HMARI(776),SN)
      EQUIVALENCE (ND1(5761),GMAR)
      INTEGER DEE,BEE
      DO 1 I=1,5
      DO 1 J=1,5
      CN(1,I,J) = 0.0
      DO 1  K=1,30
```

f. End of UNPACK, Start of MERGES

Figure 60. Continued.

```
      CN(K+1,I,J) = 0.0
    1 SN(K,I,J) = 0.0
C *** SPAN LOOP
      ISWTCH=0
      DO 2 I=1,5
C *** CHORD LOOP
      DO 2 J=1,5
      ISW = 0
      IREEL = 0
    3 IREEL = IREEL+1
      IF  (IREEL .GT. 5) GO TO 2
      NC = 0
    4 NC = NC+1
      IF(IDD.NE.1) GO TO 25
      WRITE(6,20) I,J,NC,IREEL,NSTATR(IREEL,NC),NSTATC(IREEL,NC),
     X    NTBDX(IREEL,NC)
   20 FORMAT(    6I13,5X,A6)
   25 IF(NC.GT.10) GO TO 3
      IF(NSTATR(5,2).EQ.0 .AND. IREEL.EQ.5 .AND. NC.EQ.2)   GO TO 5
      IF(NSTATR(5,3).EQ.0 .AND. IREEL.EQ.5 .AND. NC.EQ.3)   GO TO 55
   15 IF(NSTATR(IREEL,NC).NE.I) GO TO 4
      IF(NSTATC(IREEL,NC).NE.J) GO TO 4
      IF(NTBDX(IREEL,NC).EQ.DEE) GO TO 6
      IF(NTBDX(IREEL,NC).EQ.BEE) GO TO 7
      IRTOP = IREEL
      NCTOP = NC
      ISW = ISW+1
      GO TO 8
    7 IRBOT = IREEL
      NCBOT = NC
      ISW = ISW+1
    8 IF(ISW.NE.2) GO TO 4
      CN(1,J,I) = AN(1,NCBOT,IRBOT) - AN(1,NCTOP,IRTOP)
      DO 10 K=1,30
      CN(K+1,J,I) = AN(K+1,NCBOT,IRBOT)-AN(K+1,NCTOP,IRTOP)
   10 SN(K,J,I) = BN(K,NCBOT,IRBOT)-BN(K,NCTOP,IRTOP)
      GO TO 2
C *** COLLECTIVE, LONGITUDINAL CYCLIC, AND LATERAL CYCLIC PITCH ANGLES
C     FOUND NEXT.
    5 CONTINUE
      B0  = AN(1,2,5)
      B1C = AN(2,2,5)
      B1S = BN(1,2,5)
      IF  (IDD .EQ. 1)   WRITE(6,21)    B0,B1C,B1S,IREEL,NC,I,J
      GO TO 4
   55 CONTINUE
      F0  = AN(1,3,5)
      F1C = AN(2,3,5)
      F1S = BN(1,3,5)
      IF  (IDD .EQ. 1)   WRITE(6,21)    F0,F1C,F1S,IREEL,NC,I,J
   21 FORMAT(' ',7G13.6)
       O TO 4
    6 CN(1,J,I) = AN(1,NC,IREEL)
      DO 11 K=1,30
      CN(K+1,J,I) = AN(K+1,NC,IREEL)
   11 SN(K,J,I) = BN(K,NC,IREEL)
    2 CONTINUE
      RETURN
      END
@I  FOR  DFSRIE
      SUBROUTINE DFSRIE(NP,NH,Y,A,B)
      DIMENSION Y(NP),A(1),B(1)
C                 ---------------------------------------------------
C                 NUMBER OF HARMONICS  MUST NOT EXCEED HALF
C                 THE NUMBER OF DATA POINTS INPUTED.
C                 ---------------------------------------------------
```

g. End of MERGES, Start of DFSRIE

Figure 60. Continued.

```
      NNH=MINO(NH,NP/2)
C--------------------------------------------------------------------
C     INITIALIZATION AND CONSTANTS.
C--------------------------------------------------------------------
      SP=0.
      CP=1.
      RN=2./NP
      B(1)=0.
      A(1)=0.
      ARG=RN*3.14159265
      C=COS(ARG)
      S=SIN(ARG)
C--------------------------------------------------------------------
C     COMPUTE A FOR THE ZEROTH HARMONIC
C--------------------------------------------------------------------
      DO10I=1,NP
10    A(1)=A(1)+Y(I)
      A(1)=RN*A(1) /2.
C--------------------------------------------------------------------
C     MAIN LOOP.
C--------------------------------------------------------------------
       DO 100 K=1,NNH
      X=C*CP-S*SP
      SP=C*SP+S*CP
      CP=X
      U=0.
      V=0.
C     COMPUTE RECURSIVE U,S
      DO20II=2,NP
      J=NP-II+2
      W=Y(J)+2.*CP*V-U
      U=V
20    V=W
      A(K+1)=RN*(Y(1)+CP*V-U)
100   B(K+1)=RN*SP*V
      RETURN
      END
QI  FOR  CUE
      SUBROUTINE CUE(N,FM,MFIELD)
       COMMON /BK1/ IDD,BB,AA,XA(5,5),DPSI,RR(5),OMEG,CC,NBLADE,MLIMRN,
     * MLIMDP,XFP(20),YFP(20),ZFP(20),GAMA,R0,BLADEL,B0,B1C,B1S,PUNCH,
     * LSPAN,FROC(30),TCOP,SLOPE(10,5),OFFSET(10,5),KUNIT(5),IBURST,
     * IRS(5),ITRACK(5),FI(5,5),NCHAN(5,5),E386OP,NFT,ANG,KEY1,KEY2,
     * KEY3,NHH,CAPRF(20),THETAF(20),ALFAF(20),OPRONO,NCH(5),INTERM,
     * IREEL,MC,NTBDX(5,10),NSTATC(5,10),NSTATR(5,10),ISET(5),IREELS,
     * NOCH(5),LAZI
      COMMON /BK2/ NCYCLE,CYCLES,KU,NDIV(4),BMASK(6),NN(435),LIRS,
     * KTRACK,KBURST,KREC,ND1(144,10,5),ND2(144,10,5),XL0(7),XLM(7,40),
     * XMM(7,40),TEMP1(7),TEMP2(7),TEMP3(7),PI,AZMTH2(144),AZMTH(144),
     * DPRAD,AZRAD,NO,YES,NBLANK,TEE,BEE,DEE,GMARI(288,20),
     * HMARI(288,20),X0(20)
      COMMON /BK3/ SPLM(10,20),AZMTH3(288),
     * SPAN(20),                    PMRMS(10,20),
     * ICHANL(10,5),COSINE(288),SINE(288),BLADES,CARD,TAPE
      EQUIVALENCE    (ND2(5761),HMAR),
     $               (GMARI,AN),
     * (GMARI(1551),BN),(HMARI,CN),(HMARI(776),SN),(ND2,Q2)
      DIMENSION CN(31,5,5),SN(30,5,5),AN(31,10,5),BN(30,10,5),
     * GMAR(144,5),HMAR(144,5)
     * ,Q1(288,20),Q2(288,20)
      EQUIVALENCE (ND1(5761),GMAR),(ND1,Q1)
      COMMON /NEW/ F0,F1C,F1S,TOTIME,THETA
       GAMMA(J) = (F0 + F1C*COSINE(J) + F1S*SINE(J)) * T5
      T1=PI/30.
      T5=PI/180.
      THETAR=THETA*T5
```

h. End of DFSRIE, Start of CUE

Figure 60. Continued.

```
C *** SPAN LOOP
      IF(IDD.NE.1) GO TO 7
      WRITE(6,3) XFP
      WRITE(6,3) YFP
      WRITE(6,3) ZFP
      WRITE(6,3) SPAN
      WRITE(6,3) COSINE
      WRITE(6,3) SINE
      WRITE(6,3) AZMTH3
      WRITE(6,3) OMEG,CC,GAMA,R0,B0,B1C,B1S,FM,BLADES,T1,T5
    3 FORMAT(1H0/(2X,1P10E13.5))
    7 DO 1 I=1,LSPAN
C *** AZIMUTH LOOP
      DO 1 J=1,LAZI
      S = SQRT((XFP(MFIELD)-SPAN(I)*COSINE(J))**2 + (YFP(MFIELD)-SPAN(I)
     X *SINE(J))**2 + ZFP(MFIELD)**2)
      B =(B0 - GAMA*(SPAN(I)-R0) + B1C*COSINE(J) + B1S*SINE(J))*T5
      SINB = SIN(B)
      COSB = COS(B)
      T4 = FM*BLADES*(AZMTH3(J)+(S*OMEG*T1)/CC)
      T2 = COS(T4)
      T3 = SIN(T4)
      T4= (FM*BLADES*OMEG/(CC*S**2))*T1
      IF(N.EQ.3) GO TO 2
      Q1(J,I) = SPAN(I)
     $          * ( (XFP(MFIELD) - SPAN(I)*COSINE(J))
     $          * ( (SINB*SINE(J) - COSB*SIN(GAMMA(J))*COSINE(J))
     $                                          * COS(THETAR)
     $                          + COSB*COS(GAMMA(J))*SIN(THETAR) )
     $             - (YFP(MFIELD) - SPAN(I)*SINE(J))
     $               * (SINB*COSINE(J)
     $                          + COSB*SIN(GAMMA(J))*SINE(J ))
     $          +  ZFP(MFIELD) * ( COSB*COS(GAMMA(J))*COS(THETAR)
     $                          + ( COSB*SIN(GAMMA(J))*COSINE(J)
     $                            - SINB*SINE(J))*SIN(THETAR) ) )
      Q2(J,I) = Q1(J,I)*(GMARI(J,I)*(-T2/S**3 - T4*T3) +
     X HMARI(J,I)*(T3/S**3 - T4*T2))
      IF(IDD.NE.1) GO TO 1
      IF(I.GT.2) GO TO 1
      IF(J.GT.20) GO TO 1
      WRITE(6,4) I,J,MFIELD
    4 FORMAT(1H0,6I13)
      WRITE(6,3) S,B,SINB,COSB,T2,T3,T4,GMARI(J,I),HMARI(J,I),
     X  Q1(J,I),Q2(J,I)
      GO TO 1
    2 Q2(J,I) = Q1(J,I)*(GMARI(J,I)*(-T3/S**3 + T4*T2) +
     X HMARI(J,I)*(-T2/S**3 - T4*T3))
    1 CONTINUE
      RETURN
      END
@I  FOR  INTERP
      SUBROUTINE INTERP
C *** THIS SUBR. INTERPOLATES PRESSURE PULSE HARMONICS FOR UP TO 20 SPAN
C     STATIONS AND 288 AZIMUTHS.
       COMMON /BK1/ IDD,BB,AA,XA(5,5),DPSI,RR(5),OMEG,CC,NBLADE,MLIMRN,
     * MLIMUP,XFP(20),YFP(20),ZFP(20),GAMA,R0,BLADEL,BQ,B1C,B1S,PUNCH,
     * LSPAN,FROC(30),TCOP,SLOPE(10,5),OFFSET(10,5),KUNIT(5),IBURST,
     * IRS(5),ITRACK(5),FI(5,5),NCHAN(5,5),E3860P,NFT,ANG,KEY1,KEY2,
     * KEY3,NHH,CAPRF(20),THETAF(20),ALFAF(20),OPRONO,NCH(5),INTERM,
     * IREEL,NC,NTBOX(5,10),NSTATC(5,10),NSTATR(5,10),ISET(5),IREELS,
     * NOCH(5),LAZI
      COMMON /BK2/ NCYCLE,CYCLES,KU,NDIV(4),BMASK(6),NN(435),LIRS,
     * KTRACK,KBURST,KREC,ND1(144,10,5),ND2(144,10,5),XL0(7),XLM(7,40),
     * XNH(7,40),TEMP1(7),TEMP2(7),TEMP3(7),PI,AZMTH2(144),AZMTH(144),
     * DPRAD,AZRAD,NO,YES,NBLANK,TEE,BEE,DEE,GMARI(288,20),
     * HMARI(288,20),XO(20)
```

i. End of CUE, Start of INTERP

Figure 60. Continued.

```
      DIMENSION CN(31,5,5),SN(30,5,5),AN(31,10,5),BN(30,10,5),
     * GMAR(144,5),HMAR(144,5)
      EQUIVALENCE   (ND2(5761),HMAR),
     $              (GMARI,AN),
     * (GMARI(1551),BN),(HMARI,CN),(HMARI(776),SN)
      EQUIVALENCE (ND1(5761),GMAR)
      DIMENSION YO(20)
       T1 = .2305
       T2 = .7695
C *** WE FIRST DEFINE THE RADIAL STATION GRID XO(20)
      XO(1) = T1
      XO(LSPAN) = 1.
      K=LSPAN-1
      DEL=K
      DEL = T2/DEL
      DO 1 J=2,K
    1 XO(J)=XO(J-1)+DEL
      KKK = 1
      TEMP1(1) = 0.
      TEMP3(1) = 0.
      TEMP2(1) = T1
C *** RADIAL STATION LOOP   (ZERO AZIMUTH BEGIN)
      DO 2 K=1,5
      IF(IRS(K).EQ.0) GO TO 2
      KKK = KKK+1
      TEMP1(KKK) = GMAR(1,K)
      TEMP3(KKK) = HMAR(1,K)
      TEMP2(KKK) = RR(K)
    2 CONTINUE
      NOPTS1 = KKK+1
      TEMP1(NOPTS1) = 0.
      TEMP3(NOPTS1) = 0.
      TEMP2(NOPTS1) = 1.
      CALL CURVIT (NOPTS1,TEMP2,TEMP1,W,LSPAN,XO,YO)
      DO 3 K=1,LSPAN
    3 GMARI(1,K) = YO(K)
      CALL CURVIT(NOPTS1,TEMP2,TEMP3,W,LSPAN,XO,YO)
      DO 4 K=1,LSPAN
    4 HMARI(1,K) = YO(K)
      D = (DPSI/2.5) + .00001
      ISI = 0
      JJ = ISI
      JAZ2 = 1
      J = 3
      ISI2=ISI
      IF(ISI.EQ.0) ISI2=1
      LOW = ISI2+1
C *** AZIMUTH LOOP
      DO 5 JAZ=LOW,144,ISI2
      JAZ2 = JAZ2+1
      KKK=1
      DO 6 K=1,5
      IF(IRS(K).EQ.0) GO TO 6
      KKK = KKK+1
      TEMP1(KKK) = GMAR(JAZ,K)
      TEMP3(KKK) = HMAR(JAZ,K)
    6 CONTINUE
      CALL CURVIT(NOPTS1,TEMP2,TEMP1,W,LSPAN,XO,YO)
      IF(ISI.GE.1) J=JAZ2
      DO 7 K=1,LSPAN
    7 GMARI(J,K) = YO(K)
      CALL CURVIT(NOPTS1,TEMP2,TEMP3,W,LSPAN,XO,YO)
      DO 8 K=1,LSPAN
    8 HMARI(J,K) = YO(K)
      IF(JJ.NE.0) GO TO 5
      DO 9 K=1,LSPAN
```

j. INTERP Continued

Figure 60. Continued.

```
      GMARI(J-1,K) = (GMARI(J,K)+GMARI(J-2,K))/2.                       L76P0810
    9 HMARI(J-1,K) = (HMARI(J,K)+HMARI(J-2,K))/2.                       L76P0820
      J=J+2                                                             L76P0830
    5 CONTINUE                                                          L76P0840
      IF(JJ.NE.0) RETURN                                                L76P0850
      J=J-2                                                             L76P0860
      DO 10 K=1,LSPAN                                                   L76P0870
      GMARI(J+1,K) = (GMARI(1,K) + GMARI(J  ,K))/2.                     L76P0880
   10 HMARI(J+1,K) = (HMARI(1,K) + HMARI(J  ,K))/2.                     L76P0890
      RETURN                                                            L76P0900
      END                                                               L76P0910
@I  FOR  CURVIT
      SUBROUTINE CURVIT (MM, X9, Y9, W, N, X0, Y0)                      L76V0010
C                                                                       L76V0020
C                                                                       L76V0030
C        PRESENTLY W IS NOT USED IN THIS ROUTINE, HOWEVER, IT SHOULD BE L76V0040
C     DIMENSIONED IN THE CALLING PROGRAM.                               L76V0050
C                                                                       L76V0060
C   *    W  WILL BE USED LATER FOR A WORK VECTOR. -- COEF'S DIMENSION   L76V0070
C*****   WILL BE CHANED ALSO.-SO,FOR NOW ASSUME THE INPUT IS SORTED*****L76V0080
C   *                                                                   L76V0090
      DIMENSION  X(14),Y(7), W(1), X0(1), Y0(1), CUBE(3), ROOT(3),      L76V0100
     *   ROOTI(3), X9(1), Y9(1)                                         L76V0110
       COMMON /COTAN/ TIN( 7,2), COEF(4, 7,2)                           L76V0120
       DO 1 I=1,MM                                                      L76V0130
      X(I) = X9(I)                                                      L76V0140
      X(I+7) = Y9(I)                                                    L76V0150
    1 Y(I) = Y9(I)                                                      L76V0160
      IF (MM .GE. 2) GO TO 10                                           L76V0170
      IF (MM .EQ. 0) Y = 0.                                             L76V0180
      DO  5  I=1,N                                                      L76V0190
    5 Y0(I) = Y                                                         L76V0200
      WRITE (6,100)      ( X0(I), Y0(I), I=1,N)                         L76V0210
  100 FORMAT ( 94H0 PROBLEM WITH CURVE FITS (CURVIT) - LESS THAN TWO POIL76V0220
     *NTS ON THIS CURVE. - INPUT X    OUTPUT Y, /(72X, 2E11.4, /) )     L76V0230
      RETURN                                                            L76V0240
   10 CALL PARAM (MM, X,       2)                                       L76V0250
      DO  90  J=1,N                                                     L76V0260
      TUM1=1                                                            L76V0270
      DO  20  I=1,MM                                                    L76V0280
      K=I-1                                                             L76V0290
   20 IF( X0(J) .LT. X(I) ) GO TO 30                                    L76V0300
      IF( X0(J) .EQ. X(I) ) GO TO 48                                    L76V0310
      TUM1=-1                                                           L76V0320
      I=  MM                                                            L76V0330
   25 TUM1=-TUM1                                                        L76V0340
      SLOPE = TIN(I,2)/TIN(I,1)* TUM1                                   L76V0350
      CONST = Y(I) - SLOPE*X(I)                                         L76V0360
      Y0(J) = SLOPE*X0(J) + CONST                                       L76V0370
      GO TO 90                                                          L76V0380
   30 IF (I .EQ. 1) GO TO 25                                            L76V0390
   35 IF (X0(J) .EQ. X9(K)) GO TO 64                                    L76V0400
C        K REFER TO THE SECTION FROM WHICH WE NEED THE COEFFICIENTS.    L76V0410
      D= COEF(4,K,1)                                                    L76V0420
      DO  40 I=1,3                                                      L76V0430
   40 CUBE(I) = COEF(I,K,1)/D                                           L76V0440
      CUBE(1) = CUBE(1) - X0(J)/D                                       L76V0450
      CALL CUBIC (CUBE(3), CUBE(2), CUBE, ROOT, ROOTI )                 L76V0460
      DO  50 I=1,3                                                      L76V0470
      IF ( ABS(ROOT(I))  .LE. .0001) ROOT(I) = 0.                       L76V0480
      IF ( ABS(ROOT(I)-1.).GT..0001) GO TO 49                           L76V0490
   48 ROOT(I) = 1.                                                      L76V0500
      Y0(J) = Y9(K+1)                                                   L76V0510
      GO TO 90                                                          L76V0520
   49 IF(ROOTI(I).NE.0.) GO TO 50                                       L76V0530
      IF(ROOT(I).LT.0.) GO TO 50                                        L76V0540
```

k. End of INTERP, Start of CURVIT

Figure 60. Continued.

```
      IF(ROOTI(I).GT.I.) GO TO 50
      GO TO 60                                                          L76V0550
   50 CONTINUE                                                          L76V0560
C     ** THERE IS NO SOLN.  **                                          L76V0570
      WRITE(6,101) (COEF(I,K,1), I=1,4), K, YO(J), (ROOT(I),ROOTI(I),I=1L76V0580
     *,3)                                                               L76V0590
  101 FORMAT ( 39H0   A ROOT FOR THE CUBIC EQUATION   X =, E11.4,3H + , L76V0600
     *  E11.4, 7H * T + , E11.4, 9H * T*T + , E11.4, 7H * T**3,13H  IN SL76V0610
     *ECTION , I3, // 6X, 42H DOES NOT EXIST BETWEN 0. AND 1. WHEN X = ,L76V0620
     *E13.5,47H AND THE ROOTS ARE -    REAL              IMAGINARY,(/77X, L76V0630
     *E15.7, 2X,E15.7 ) )                                               L76V0640
      T = .5                                                            L76V0650
      GO TO 61                                                          L76V0660
   64 T= 0.                                                             L76V0670
      GO TO 61                                                          L76V0680
   60 T = ROOT(I)                                                       L76V0690
   61 YO(J) = COEF(1,K,2) + COEF(2,K,2)*T + COEF(3,K,2)*T*T +           L76V0700
     *           COEF(4,K,2)*T**3                                       L76V0710
   90 CONTINUE                                                          L76V0720
      END                                                               L76V
QI   FOR  AVQUAD                                                        L76V0730
      SUBROUTINE AVQUAD (N,X,Y,AREA)
C     INTEGRATION BY AVERAGED QUADRATICS BASED ON LAGRANGE INTERPOLATIONL76A0010
      DIMENSION X(12),Y(12)                                             L76A0020
      AREA=0.                                                           L76A0030
      T1=Y(1)/((X(1)-X(2))*(X(1)-X(3)))                                 L76A0040
      T2=Y(2)/((X(2)-X(1))*(X(2)-X(3)))                                 L76A0050
      T3=Y(3)/((X(3)-X(1))*(X(3)-X(2)))                                 L76A0060
      A2=T1+T2+T3                                                       L76A0070
      B2=-(T1*(X(2)+X(3))+T2*(X(1)+X(3))+T3*(X(1)+X(2)))                L76A0080
      C2=T1*X(2)*X(3)+T2*X(1)*X(3)+T3*X(1)*X(2)                         L76A0090
      AREA=AREA+(A2/3.)*((X(2)**3)-(X(1)**3))+(B2/2.)*((X(2)**2)-(X(1)**L76A0100
     12))+C2*(X(2)-X(1))                                                L76A0110
      N2=N-2                                                            L76A0120
      DO 101 K=2,N2                                                     L76A0130
      A1=A2                                                             L76A0140
      B1=B2                                                             L76A0150
      C1=C2                                                             L76A0160
      T1=Y(K)/((X(K)-X(K+1))*(X(K)-X(K+2)))                             L76A0170
      T2=Y(K+1)/((X(K+1)-X(K))*(X(K+1)-X(K+2)))                         L76A0180
      T3=Y(K+2)/((X(K+2)-X(K))*(X(K+2)-X(K+1)))                         L76A0190
      A2=T1+T2+T3                                                       L76A0200
      B2=-(T1*(X(K+1)+X(K+2))+T2*(X(K)+X(K+2))+T3*(X(K)+X(K+1)))        L76A0210
      C2=T1*X(K+1)*X(K+2)+T2*X(K)*X(K+2)+T3*X(K)*X(K+1)                 L76A0220
      A=(A1+A2)/2.                                                      L76A0230
      B=(B1+B2)/2.                                                      L76A0240
      C=(C1+C2)/2.                                                      L76A0250
  101 AREA=AREA+(A/3.)*((X(K+1)**3)-(X(K)**3))+(B/2.)*((X(K+1)**2)-(X(K)L76A0260
     1**2))+C*(X(K+1)-X(K))                                             L76A0270
      AREA=AREA+(A2/3.)*((X(N)**3)-(X(N-1)**3))+(B2/2.)*((X(N)**2)-(X(N-L76A0280
     11)**2))+C2*(X(N)-X(N-1))                                          L76A0290
      RETURN                                                            L76A0300
      END                                                               L76A0310
QI   FOR  CUBIC                                                         L76A0320
      SUBROUTINE CUBIC ( P, Q, R, ROOT, ROOTI )
C  CUBIC FINDS THE REAL + COMPLEX ROOTS OF (X**3)+P*(X**2)+Q*(X)+R=0    L76U0010
      DIMENSION                  ROOT(3),ROOTI(3)                       L76U0020
   90 DO 220 I=1,3                                                      L76U0030
      ROOT(I)= 0.                                                       L76U0040
  220 ROOTI(I)=0.                                                       L76U0050
      P3  = P/3.                                                        L76U0060
      SMALLA  =  Q - P*P3                                               L76U0070
      SMALLB  =  2. *P3**3 - P3* Q +R                                   L76U0080
      AD3  =  SMALLA/3.                                                 L76U0090
      SB2  =  SMALLB/2.                                                 L76U0100
      B4 =   SB2**2                                                     L76U0110
                                                                        L76U0120
```

1. End of CURVIT, AVQUAD, Start of CUBIC

Figure 60. Continued.

```
      A27 =    AD3 **3
      SMALLC =  D4 + A27
      IF (SMALLC)14 , 1 ,5
    1 XA=SQRT (-AD3)
      IF (SMALLB) 3,4,4
    3 XA=-XA
    4 ROOT(1) =XA-P3
      ROOT(2) = ROOT(1)
      ROOT(3) = -XA-XA-P3
      GO TO 22
    5 POWER = 1./ 3.
      B2 =  - SMALLB / 2.
      SBA= SQRT  ( SMALLC)
      BIGA = B2 + SBA
      BIGB =  B2 -SBA
      IF ( BIGA ) 6  , 7 , 8
    6 BIGA1 =-((-BIGA )** POWER  )
      GO TO 9
    7 BIGA1 =0.
      GOTO  9
    8 BIGA1 =    ( BIGA)** POWER
    9 IF ( BIGB )10 , 11, 12
   10 BIGB1 =-((-BIGB) ** POWER  )
      GO TO 13
   11 BIGB1 = 0.
      GO TO 13
   12 BIG B1  = (BIGB) ** POWER
   13 AB = BIGA1+BIGB1
      ROOT (1) = AB-P3
      ROOTI(1) =    0.
      ROOT (2) = -AB/2.-P3
      ROOT (3) =    ROOT(2)
      ROOTI(2) =  SQRT (3.)/2. *( BIGA1 - BIGB1)
      ROOTI(3) =  - ROOTI (2)
      GO TO 22
   14 RAD  = 57.2957795
      CON  = 120./ RAD
      A3   =  SQRT  ( -AD3)
      IF  (SMALLB ) 15, 16, 17
   15 COT = 0.
      CP = 1.
      GO TO 18
   16 PH3 = 30./ RAD
      GO TO 19
   17 COT  = 180. /RAD
      CP= -1.
   18 B4A27 =  - B4 /A27
      COSPHI =  CP* SQRT ( B4A27)
      XK    = SQRT  ( 1.- B4A27)
      PHI   = ATAN ( XK/ COSPHI )
      PH3 = (COT + PHI*CP/3.)
   19 DO  20  I= 1,3
   20 ROOTI(I) = 0.
      AK = A3+ A3
      ANGLE  =PH3
      DO 21 I = 1,3
      ROOT (I) = AK * COS  (ANGLE)-P3
   21 ANGLE = ANGLE +CON
   22 RETURN
      END
$IBFTC SIMCOR
      SUBROUTINE SIMCOR (N,H,Y,XINT,IERR)
C     PURPOSE
C
C          TO INTEGRATE A FUNCTION F(X) OVER A RANGE (A,B)
C
```

m. End of CUBIC, Start of SIMCOR

Figure 60. Continued.

```
C       METHOD
C
C           SIMPSONS RULE WITH A CORRECTION FACTOR INCORPORATED
C            IN THE EQUATION IS USED IF (N-1) IS DIVISIBLE BY
C            BOTH 2 AND 4
C
C           SIMPSONS RULE IS USED WITHOUT THE CORRECTION FACTOR
C            IF (N-1) IS ONLY DIVISIBLE BY 2
C
C           IF (N-1) IS NOT DIVISIBLE BY 2 THIS IMPLIES THAT N
C             IS EVEN AND THIS SUBROUTINE CAN NOT BE USED.
C
C       CALLING SEQUENCE
C
C           CALL SIMCOR (N,H,Y,XINT,IERR)
C
C       DESCRIPTION OF PARAMETERS
C
C             N    -NUMBER OF POINTS THAT ARE TAKEN OVER THE CURVE
C
C             H    -CONSTANT INTERVAL BETWEEN THE POINTS
C
C             Y    -SUPPLIED FUNCTION
C
C             XINT-TOTAL AREA UNDER THE CURVE BETWEEN A AND B
C
C             IERR-ERROR CODE
C                   IERR = 0  (N-1) NOT DIVISIBLE BY 2 THEREFORE N IS EVEN
C                   IERR = 1  (N-1) IS  DIVISIBLE BY 2
C                   IERR = 2  (N-1) IS  DIVISIBLE BY BOTH 2 AND 4
C
C
        DIMENSION Y(1)
        IERR = 0
        K = MOD ((N-1),4) + 1
        IF (K .EQ. 2 .OR. K .EQ. 4) RETURN
        XINT = Y(1) + 4.* Y(N-1) + Y(N)
        N3 = N - 3
        DO 10 I = 2,N3,2
     10 XINT = XINT + 4.* Y(I) + 2.* Y(I+1)
        XINT = H/3.0 * XINT
        IERR = 1
        IF(K .EQ. 3 .OR. N .LT. 9) RETURN
        XINT1= Y(1) + 4.* Y(N-2) + Y(N)
        N6 = N-6
        DO 20 I = 3,N6,4
     20 XINT1= XINT1+ 4.* Y(I) + 2.* Y(I+2)
        XINT1= 2.* H/3. * XINT1
        XINT = XINT + (XINT - XINT1)/15.
        IERR = 2
        RETURN
        END
@1  FOR  TRIDAG
        SUBROUTINE TRIDAG(A,B,K1,Z )
        DIMENSION A( 7,8),B(7),Z(7)
      1 FORMAT (10X,50HT=0. .OR. S=0. IN TRIDAG.  CANNOT DIVIDE BY S OR T)
C
C       PURPOSE
C           TO SOLVE THE TRIDIAGONAL MATRIX EQUATION
C
C           *********---------- ***        ***
C           *    *    *         - * *      * *
C           * S  * R  *         - * *      * *
C           *    *    *         - * *      * *
C           *************       - * *      * *
C           *    *    *    *    - * *      * *
```

n. End of SIMCOR, Start of TRIDAG

Figure 60. Continued.

```
C         * T * S * R *   - * *         * *
C         *   *   *   *   - * *   ---   * *
C         ***************  *Z*         *G*
C         -   *   *   *   * * *   ---   * *
C         -   * T * S * R * * *         * *
C         -   *   *   *   * * *         * *
C         -   ************* * *         * *
C         -       *   *   * * *         * *
C         -       * T * S * * *         * *
C         -       *   *   * * *         * *
C         ----------********* ***       ***
C
C     FOR THE SOLUTIONS Z, WHERE GAUSS IS NOT USED AND THE SUB-MATRICES
C     ALL CONSIST OF A SINGLE ELEMENT.
C
C     DESCRIPTION OF PARAMETERS
C        A -- MATRIX WHOSE THREE DIAGONALS CENTERED ON THE PRINCIPAL
C               DIAGONAL BECOME THE TRIDIAGONAL MATRIX.
C        G -- RIGHT HAND SIDE OF EQUATION.  VECTOR OF LENGTH K1.
C        K1-- NUMBER OF ROWS IN THE MATRIX A.
C        Z -- SOLUTIONS, VECTOR (COLUMN) OF LENGTH K1 .
C
C
C     FIND THE LAST SOLUTION, Z(K1)
C
      S= A(1,1)
      R= A(1,2)
      IF (S .EQ. 0.) GO TO 25
      C= G(1)/S
      D= -R/S
      K2 = K1-1
      DO 10 I=2,K2
      T = A(I,I-1)
      S = A(I,I)
      R = A(I,I+1)
      DENOM = T*D+S
      C = (G(I)-C*T)/DENOM
      D = -R/DENOM
   10 CONTINUE
      S= A(K1,K1)
      T= A(K1,K1-1)
      Z(K1)=(G(K1)-T*C)/(T*D+S)
C
C     CALCULATE OTHER SOLUTIONS, PROCEEDING BACKWARDS
C
      IF(T .EQ. 0. ) GO TO 25
      Z(K1-1) = ( G(K1)-Z(K1)*S)/T
   15 K3=K2-1
      DO 20 I=2,K3
      J = K1-I
      S = A(J+1,J+1)
      R = A(J+1,J+2)
      T = A(J+1,J)
      IF(T .EQ. 0. ) GO TO 25
      Z(J) = ( G(J+1)-S*Z(J+1)-R*Z(J+2))/T
   20 CONTINUE
      Z(1) = (G(1)-A(1,2)*Z(2))/A(1,1)
      RETURN
   25 WRITE(6,1)
      RETURN
      END
@I  FOR  PARAM
      SUBROUTINE PARAM (N, P,       IJ )
      DIMENSION G( 7), P( 7,2),DEL( 7,2),DIST( 7),A( 7, 8),Q( 7,2)
       COMMON /COTAN/   T( 7,2), COE (4, 7,2)
      N1 = N-1
```

O. End of TRIDAG, Start of PARAM

Figure 60. Continued.

```
      N2 = N-2
      N3 = N-3
      N0=N2
      IGO = 2
      DO  15 I=1,N1
      DO 10 J=1,2
  10  DEL(I,J) =  P(I+1,J) - P(I,J)
  15  DIST(I)  =  SQRT(DEL(I,1)**2 + DEL(I,2)**2)
      DO  20 I=1,N
      DO  20 J=1,N
  20  A(I,J) = 0.
      A(1,3) = DIST(1)
      A(N2,N2) = DIST(N1)
      DO  30  I=2,N3
      A(I,I)   = DIST(I+1)
      A(I,I+1) = 2.*(DIST(I)+DIST(I+1))
      A(I,I+2) = DIST(I)
      DO 30 J=1,2
  30  Q(I,J)   = 3.*(DIST(I)/DIST(I+1)*DEL(I+1,J)+DIST(I+1)/DIST(I)*DEL(
     *  I,J))
   12 A(1,2) = 2.* DIST(1) + DIST(2)*1.5
C  12 A(1,2) = 2.*(DIST(1) + DIST(2))
      DO 33 J=1,2
C 33  Q(1,J) = 3.*(DIST(1)/DIST(2)*DEL(2,J)+DIST(2)/DIST(1)*DEL(1,J)) -
  33  Q(1,J) = 3.*(DIST(1)/DIST(2)*DEL(2,J)+DIST(2)/DIST(1)*DEL(1,J)/2.)
C    * DIST(2)* T(1,J)
C  22 A(N2, N1 ) = 2.*(DIST(N2 ) + DIST(N1 ))
   22 A(N2, N1 ) =1.5* DIST(N2 ) + DIST(N1 )*2.
      DO 27 J=1,2
   27 Q(N2, J)   =1.5*(DIST(N2 )/DIST(N1 )*DEL(N1, J)   +DIST(N1 )/DIST
C  27 Q(N2, J)   = 3.*(DIST(N2 )/DIST(N1 )*DEL(N1, J)   +DIST(N1 )/DIST
     *(N2 )*DEL(N2, J))
C    *(N2 )*DEL(N2, J)) - DIST(N2 )* T(N,J)
  17  DO 45 J=1,2
      DO  36  I=1,N0
   36 G(I)=Q(I,J)
      CALL TRIDAG(A(1,2),G,N0,T(2,J))
      T(1,J) = 1.5/DIST*DEL(1,J) - .5*T(2,J)
      T(N,J) = 1.5/DIST(N1)*DEL(N1,J) - .5*T(N1,J)
  44  DO  45  I=1,N1
      COE(4,I,J)=-2.*DEL(I,J) + DIST(I)*( T(I+1,J)+T(I,J) )
      COE(3,I,J)= 3.*DEL(I,J) - DIST(I)*( T(I+1,J)+2.*T(I,J) )
      COE(2,I,J)= DIST(I)*T(I,J)
  45  COE(1,I,J)= P(I,J)
      RETURN
      END
@I  FOR  E386RN
      SUBROUTINE E386RN
C     ACOUSTIC PRESSURE       V.BERECZ FOR R.KING     DECK E386
       COMMON /BK1/ IDD,BB,AA,XA(5,5),DPSI,RR(5),OMEG,CC,NBLADE,MLIMRN,
     * MLIMOP,XFP(20),YFP(20),ZFP(20),GAMA,RO,BLADEL,B0,B1C,B1S,PUNCH,
     * LSPAN,FROC(30),TGOP,SLOPE(10,5),OFFSET(10,5),KUNIT(5),IBURST,
     * IRS(5),ITRACK(5),FI(5,5),NCHAN(5,5),E386OP,NFT,ANG,KEY1,KEY2,
     * KEY3,NHH,CAPRF(20),THETAF(20),ALFAF(20),OPRONO,NCH(5),INTERM,
     * IREEL,NC,NTBDX(5,10),NSTATC(5,10),NSTATR(5,10),ISET(5),IREELS,
     * NOCH(5),LAZI
      COMMON /BK2/ NOYCLE,CYCLES,KU,NDIV(4),SMASK(6),NN(435),LIRS,
     * KTRACK,KBURST,KREC,ND1(144,10,5),ND2(144,10,5),XL0(7),XLM(7,40),
     * XMM(7,40),TEMP1(7),TEMP2(7),TEMP3(7),PI,AZMTH2(144),AZMTH(144),
     * OPRAD,AZRAD,NO,YES,NBLANK,TEE,BEE,DEE,GMARI(288,20),
     * HMARI(288,20),X0(20)
      DIMENSION CN(31,5,5),SN(30,5,5),AN(31,10,5),BN(30,10,5),
     * GMAR(144,5),HMAR(144,5)
      EQUIVALENCE    (ND2(5761),HMAR),
     $               (GMARI,AN),
     * (GMARI(1551),BN),(HMARI,CN),(HMARI(776),SN)
```

p. End of PARAM, Start of E386RN

Figure 60. Continued.

```
      EQUIVALENCE (NDI(5761),GHAR)
      DIMENSION            Q(721,8),R(8),V8(8),V8I(8),
     1 V25(721),V25I(721),PSI(721),PRAD(721)
      EQUIVALENCE (Q,ND1),(V25,ND2),(V25I,ND2(1,1,2)),(PSI,ND2(1,1,3)),
     $            (PRAD,ND2(1,1,4))
C
C     READ FLT. COND. PARAMETERS AND BLADE SECTION LOADING, PRINT SAME.
C
      RBN=NBLADE
      EQUIVALENCE
     X      (CH,AA),(SOS,CC),(B01,B0),(B1,B1C),(B11,B1S),(G,GAMA),
     X (NHAR,MLIMRN),                (NFT,NFP),(OMG,OMEG)
      NRAD = LIRS+2
      GATC1=B0
      GATC2=B1C
      GATC3=B1S
      GATC4=GAMA
      GATC5=OMEG
      SOS = SOS/12.0
      J=1
      R(1)=0.
      DO 730 I=1,5
      J=J+1
      IF(IRS(I).EQ.0) GO TO 730
      R(J)=RR(I)*BLADEL
  730 CONTINUE
      J=J+1
      R(J)=BLADEL
      RAD= 1./57.2957795
      NP=(360./ANG)+1.001
      NT=NP-1
      PSI(1)= 0.
      PRAD(1)=0.
      DO 4 I=2,NP
      PSI(I)= PSI(I-1)+ ANG
    4 PRAD(I)= PSI(I)*RAD
      DO 77 I=1,NRAD
      DO 77 J=1,NP
      Q(J,I)=XLO(I)
      DO 77 K=1,NHH
      X=K
   77 Q(J,I)=Q(J,I)+XLM(I,K)*COS(X*PRAD(J))+XMM(I,K)*SIN(X*PRAD(J))
      IF(KEY1.NE.99) GO TO 88
      DO 86 I=1,NRAD
   86 WRITE (6,87) XL0(I),((XLM(I,J),XMM(I,J)),J=1,NHAR)
   87 FORMAT (E25.8/,(2E25.8))
   88 WRITE (6,8) B01,B1,B11,CH,OMG,RBN,R0,(R(I),I=1,NRAD)
    8 FORMAT (4H0B01,E15.6,4H  B1,E15.6,5H  B11,E15.6,7H  CHORD,E15.6,
     1 7H  OMEGA,E15.6,8H  BLADES,F7.0,//25H RADIUS AT START OF TWIST,
     2 E15.6,////30X,21HBLADE SECTION LOADING,///7H RADIUS,10X,1H1,14X,
     3 1H2,14X,1H3,14X,1H4,14X,1H5,14X,1H6,14X,1H7,14X,1H8,/8H AZIMUTH,
     4 2X,8E15.6,//)
      DO 9 I=1,NP
    9 WRITE (6,10) I,PSI(I),(Q(I,K),K=1,NRAD)
   10 FORMAT (I4,F7.1,8E15.6)
      OMG=3.14159265*OMG/30.
      SOS=12.*SOS
      B01=B01*RAD
      B1=B1*RAD
      B11=B11*RAD
      G=G*RAD
C
C     BEGIN MAJOR LOOP ON FIELD POINTS
C
      DO 999 II=1,NFP
      CAPR=CAPRF(II)
```

q. E386RN Continued.

Figure 60. Continued.

```
      THETA=THETAF(II)
      ALFA=ALFAF(II)
   11 FORMAT (3F12.4)
      WRITE (6,12) CAPR,THETA,ALFA
   12 FORMAT (12HOFIELD POINT,10X,6HRADIUS,E15.6,5X,7HAZIMUTH,E15.6,5X,
     1 9HELEVATION,E15.6,/20X,8HHARMONIC,10X,14HSOUND PRESSURE,13X,
     2 3HSPL)
      CAPR=12.*CAPR
      ALFA= RAD*ALFA
      THETA= RAD*THETA
      DO 999 M=1,NHAR
      DO 990 KK=1,NRAD
      DO 99  JJ=1,NT
      CAPS= SQRT(CAPR*CAPR+R(KK)*R(KK)-2.*CAPR*R(KK)*COS(     ALFA)*
     1 COS(PRAD(JJ)-THETA))
      BETA=B01-G*(R(KK)-R0)+B1*COS( PRAD(JJ)   )+B11*SIN( PRAD(JJ)   )
      SBTA=SIN(BETA)
      CBTA=COS(BETA)
      V= M
      V= V*(RBN*OMG*CAPS/SOS+.5*CH*RBN/R(KK)+RBN* PRAD(JJ))
      IF (KEY3.EQ.99) WRITE (6,9874) CAPS, BETA, V
 9874 FORMAT (3E25.8)
      TEMP=  M
      V25(JJ)=(Q(JJ,KK)*SIN(.5*TEMP*RBN*CH/R(KK))*(COS(V)/CAPS+(TEMP*RBN
     1 *OMG/SOS)*SIN(V))*(SBTA*COS(ALFA)*SIN(PRAD(JJ)-THETA)+SIN(ALFA) *
     2CBTA)*R(KK))/(TEMP*CAPS*CAPS)
      V25I(JJ)=(Q(JJ,KK)*SIN(.5*TEMP*RBN*CH/R(KK))*(COS(V)*TEMP*RBN*OMG
     1 /SOS-SIN(V)/CAPS)*(SBTA*COS(ALFA)*SIN(PRAD(JJ)-THETA)+SIN(ALFA) *
     2CBTA)*R(KK))/(TEMP*CAPS*CAPS)
   99 CONTINUE
      V25(NP)=V25(1)
      V25I(NP)=V25I(1)
      CALL SIMCOR(NP,PRAD(2),V25 ,AR,IERR)
      IF(IERR .EQ. 0) WRITE(6,8418)
 8418 FORMAT(///25X,23HERROR IN SIMCOR, IERR=0  ///)
      V8(KK)=AR
      CALL SIMCOR(NP,PRAD(2),V25I,AR,IERR)
       IF(IERR .EQ. 0) WRITE(6,8418)
      V8I(KK)=AR
      IF(KEY2.EQ.99) WRITE (6,9876) V8(KK),(V25(I),I=1,NP)
      IF(KEY2.EQ.99) WRITE (6,9876) V8I(KK),(V25I(I),I=1,NP)
 9876 FORMAT (//E25.8/,(5E25.8/))
  990 CONTINUE
      CALL AVQUAD (NRAD,R,V8,PRTAR)
      CALL AVQUAD (NRAD,R,V8I,PRTAI )
      IF (KEY1.EQ.99) WRITE (6,9875)PRTAR,(V8(KK),KK=1,NRAD)
      IF (KEY1.EQ.99) WRITE (6,9875)PRTAI,(V8I(KK),KK=1,NRAD)
 9875 FORMAT (//E25.8,/4E25.8,/4E25.8,//)
      PRTA=(.03502245*CAPR/CH)*SQRT(PRTAR**2+PRTAI**2)
      SPL= 20.*ALOG10(ABS(PRTA/2.9E-9))
      WRITE (6,997) M,PRTA,SPL
  997 FORMAT (25X,I2,5X,2E20.8)
  999 CONTINUE
      B0=GATC1
      B1C=GATC2
      B1S=GATC3
      GAMA=GATC4
      OMEG=GATC5
      RETURN
      END
@I  FOR  OUTSPL
      SUBROUTINE OUTSPL
       COMMON /BK1/ IDD,BB,AA,XA(5,5),DPSI,RR(5),OMEG,CC,NBLADE,MLIMRN,
     * MLIMDP,XFP(20),YFP(20),ZFP(20),GAMA,R0,BLADE ,B0,B1C,B1S,PUNCH,
     * LSPAN,FROC(30),TCOP,SLOPE(10,5),OFFSET(10,5),KUNIT(5),IBURST,
     * IRS(5),ITRACK(5),FI(5,5),NCHAN(5,5),E386OP,NFT,ANG,KEY1,KEY2,
```

r. End of E386RN, Start of OUTSPL

Figure 60. Continued.

```
     * KEYS.NHH,CAPRF(20),THETAF(20),ALFAF(20),OPRONO,NCH(5),INTERM,      L7600060
     * IREEL,IIC,NTBDX(5,10),NSTATC(5,10),NSTATR(5,10),ISET(5),IREELS,    L7600070
     * NOCH(5),LAZI                                                        L7600080
      COMMON /BK2/ NCYCLE,CYCLES,KU,NDIV(4),BMASK(6),NN(435),LIRS,         L7600090
     * KTRACK,KBURST,KREC,ND1(144,10,5),ND2(144,10,5),XLO(7),XLM(7,40),    L7600100
     * XMM(7,40),TEMP1(7),TEMP2(7),TEMP3(7),PI,AZMTH2(144),AZMTH(144),     L7600110
     * DPRAD,AZRAD,NO,YES,NBLANK,TEE,BEE,DEE,GMARI(288,20),                L7600120
     * HMARI(288,20),XO(20)                                                L7600130
      COMMON /BK3/ SPLM(10,20),AZMTH3(288),                                L7600140
     * SPAN(20),                        PMRMS(10,20),                      L7600150
     * ICHANL(10,5),COSINE(288),SINE(288),BLADES,CARD,TAPE                 L7600160
      DIMENSION CN(31,5,5),SN(30,5,5),AN(31,10,5),BN(30,10,5),             L7600170
     * GMAR(144,5),HMAR(144,5)                                             L7600180
     * ,Q1(288,20),Q2(288,20)                                              L7600190
      EQUIVALENCE    (ND2(5761),HMAR),                                     L7600200
     $               (GMARI,AN),                                           L7600210
     * (GMARI(1551),BN),(HMARI,CN),(HMARI(776),SN),(ND2,Q2)                L7600220
      EQUIVALENCE (ND1(5761),GMAR),(ND1,Q1)                                L7600230
C *** HARMONIC LOOP                                                         L7600240
      DO 1 I=1,MLIMRN,2                                                    L7600250
      WRITE(6,2) I                                                         L7600260
    2 FORMAT(1H1, 28X, 29HROTATIONAL NOISE PROGRAM E676 / 8X,              L7600270
     X 10HHARMONIC =, I3 )                                                 L7600280
      WRITE(6,3)                                                           L7600290
    3 FORMAT(1H0, 8X, 5HFIELD, 11X, 28HFIELD POINT COORDINATES (IN),       L7600300
     X 16X, 20HSOUND PRESSURE LEVEL / 8X, 5HPOINT, 10X,1HX,14X,1HY,        L7600310
     X 14X,1HZ, 20X,  8HDECIBELS / )                                       L7600320
C *** FIELD POINT LOOP                                                      L7600330
      DO 4 J=1,NFT                                                         L7600340
    4 WRITE(6,5) J,XFP(J),YFP(J),ZFP(J),SPLM(1,J)                          L7600350
    5 FORMAT( 9X,I2,2X, 3(5X,1PE10.4),15X, 1PE10.4 )                       L7600360
      IF(I.GE.MLIMRN) GO TO 7                                              L7600370
      K=I+1                                                                L7600380
      WRITE(6,6) K                                                         L7600390
    6 FORMAT(1H2  / 8X,10HHARMONIC =,I3 )                                  L7600400
      WRITE(6,3)                                                           L7600410
C *** FIELD POINT LOOP                                                      L7600420
      DO 8 J=1,NFT                                                         L7600430
    8 WRITE(6,5) J,XFP(J),YFP(J),ZFP(J),SPLM(K,J)                          L7600440
    1 CONTINUE                                                             L7600450
    7 RETURN                                                               L7600460
      END                                                                  L7600470
@I  FOR  START
      SUBROUTINE START                                                     L76Y0010
      COMMON /TEMPUS/ TIME,COUNT                                           L76Y0020
      INTEGER COUNT                                                        L76Y0030
      DATA COUNT /0/                                                       L76Y0040
      CALL RTMINS (TIME)                                                   L76Y0050
      COUNT = COUNT + 1                                                    L76Y0060
      CALL CLOCK                                                           L76Y0070
      RETURN                                                               L76Y0080
      END                                                                  L76Y0090
@I  FOR  CLOCK
      SUBROUTINE CLOCK                                                     L76K0010
      COMMON /TEMPUS/ TIME,COUNT                                           L76K0020
      INTEGER COUNT                                                        L76K0030
      CALL RTMINS (BALLS)                                                  L76K0040
      T     = BALLS - TIME                                                 L76K0050
      WRITE (6,100) COUNT , T                                              L76K0060
  100 FORMAT (1H255X,18(1H*)/56X,8H*         (I2,8H)       */56X,18H* ELAPSEL76K0070
     XD TIME = */56X,1H*16X,1H*/56X,2H* F8.4,8H  MIN   */56X,1H*16X,1H*/5L76K0080
     X6X,18(1H*)//)                                                        L76K0090
      RETURN                                                               L76K0100
      END                                                                  L76K0110
```

s. End of OUTSPL, START, CLOCK

Fibure 60. Concluded.